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Contractors and Engineers Monthly



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Highlights Of This Issue

• Novel Aquarium Construction

Unusual aquaria providing opportunities for observation and scientific study of deep sea fish and mammals were recently completed at Marineland, Fla. Some of the details of their construction are described in this issue.

See page 2.

• Aggregates for Road Job

The production of all aggregates on the job, the construction of a concrete base, and a 22-year-old asphalt plant which produced the hot-mix top were features of a 6.83-mile highway project in Maine.

See page 2.

• Novel Tools for Grading Job

The clearing and grading of a section of the Oregon Coast Highway through virgin forest required a number of pieces of special equipment which had to be easily portable and included a boring machine, fire-fighting equipment and portable lighting unit.

See page 2.

• Well-Planned Road-Mix Job

A 27-mile road-mix job, using RC-2C asphalt and dense-graded aggregate and a retread paver for mixing, was completed between Fordyce and Sheridan, Ark., last summer.

See page 5.

• Huge Concrete Pipe

Some of the sections of the Colorado River Aqueduct called for the largest precast concrete pipe ever made, necessitating new methods of fabricating the reinforcing, pouring and handling. The special new methods used on one of the sections are described in this issue.

See page 16.

• Preparations for Winter

The old adage about an ounce of prevention, etc., though platitudinous, is true, Minnesota finds. So this State Highway Department overhauls its snow fleet during the summer so that it is ready to go far in advance of winter snows.

See page 20.

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Mississippi River Bridge

Casting Concrete Piles For Approach Trestles



C. & E. M. Photo
Tying Butt End Reinforcing for the Concrete Piles. Note the Type of Jack and Pipe Spacer for the Spiral.

† THE CASTING and driving of the concrete piles for the foundations of the approach trestles for the Mississippi River Bridge at Baton Rouge, La., was done by E. A. Whitney & Sons of Kansas City, Mo., under a subcontract from the general contractor for the approach trestle foundations, Uvalde Construction Co. of Dallas, Texas. The subcontractor set up a complete yard for the assembly of the reinforcing cages and for pouring the piles within the 150-foot right-of-way, spaced so as not to interfere with the excavation for the footings. Every operation was well planned and numerous simple devices and some patented methods were employed to speed the work and increase the accuracy of the work by green hands.

The piles cast were 14, 16 and 18 inches square, with a taper 5 feet in length to an 8-inch tip. Most of the piles were 16 inches square and 50 feet long, although a relatively few 55-foot 16-inch, 60 and 70-foot piles 18 inches square were required for abutments.

Assembling the Reinforcing

The reinforcing for the piles consisted of four 1-inch deformed rods at the corners and another down the center of each side and four zigzag rods at the sides at the three pick-up points on the pile. The eight longitudinal rods and the zigzag rods were tied to the spiral reinforcing of 1/4-inch wire preformed and then spaced on a 6-inch spiral the length of the reinforcing. At the tip and at

E. A. Whitney & Sons Used Novel Methods and Equipment to Expedite Casting And Driving at Baton Rouge

the butt the spacing was closer and was gaged by a simple device consisting of a 1 1/2-inch pipe slotted through to the diameter to give the exact spacing of the spiral. The pipe was slipped under the wire even with the end of the reinforcing and the pre-spiraled wire slipped over it with each successive wire falling into the next notch until the full 5 feet of the taper was complete. A similar method was used to space the uniform closely spaced spiral at the driving head. A rod was pushed in from the end to latch the spiral in place as it slipped into the notches.

The first assembly of the heavy reinforcing bars was handled in a novel manner. Four jacks or horses were set up for each assembly of the reinforcing. These jacks were made of 2 x 4's with two standards and held at a uniform spacing by a bar 19 inches from the top. One of the uprights was hinged at this point and could drop out away from the horse. It was normally held in place by a notched 2 x 4 at the top. The whole jack was 45 inches high and 26 inches wide. Four bars were laid on the top of three horses and the spiral spread over them for the full length and a few places tied to hold the spiral loosely.

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County Road Plans And Organization

Honest Engineering Head, Planning Well in Advance, And Proper Selection of Materials Essential

By S. E. FITCH, County Superintendent of Highways, Chautauqua County, N. Y.

† IT may be that highway engineers stick too closely to strictly engineering problems. There is much more to the successful completion of a road program than the knowledge of how many inches of aggregate mixed with such and such a quantity of this or that material should be used in one location or another. While the engineering features are important, they are only part of many important features. What, then, are the important factors necessary to carrying out such a program?

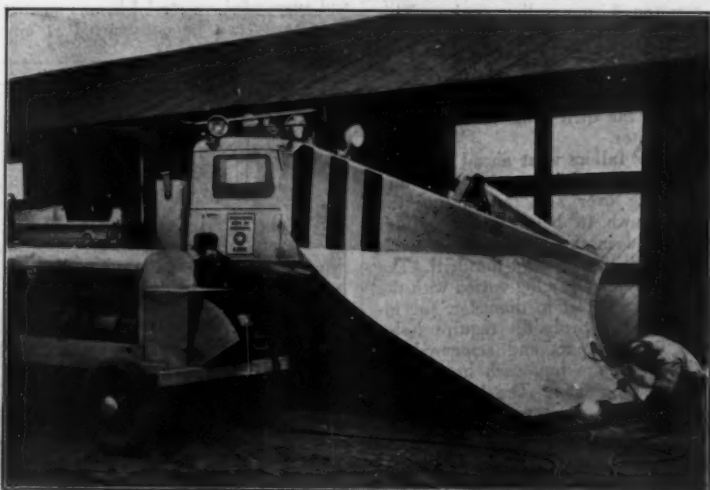
Make This Your Program

First, there must be an intelligent and high-minded governing body, the majority of the members of which are more interested in the welfare of the body politic than in what appears to be selfish political advantages which in the end usually prove to be boomerangs. This of course implies an intelligent and honest electorate with a real interest in the election of public officials. A further requisite is an effective method of selecting officials of proved worth, a condition not yet obtainable at all times in all places.

Second, as a result of the first requisite, there must be selected an honest executive engineering head, trained in his field, who will keep free from political entanglements. He must have the

(Continued on page 34)

SUMMER PREPARATION FOR WINTER SNOWS



Are Welding on One of the Minnesota Highway Department's V-Type Flows During the Summer Overhaul of Snow-Fighting Equipment. Note the Safety Stripes on the Tips of the Flow Wings. See Page 20.



The Portable Generating Unit Operating an Electric Drill for Boring Blast Holes in Logs

Portable Units On Grading Job

Special Equipment Used by R. L. Houck to Overcome Conditions on Rough Section Of Oregon Coast Highway

By HENRY W. YOUNG

✦ WORKING on a tough section of the Oregon Coast Highway, R. L. Houck of Salem, Ore., put it up to his two trusty mechanics, DuMont and McCracken, to build or assemble and put into operation all kinds of special pieces of equipment to keep the job going at top speed and with safety. The contract was known as the Short Sand Beach section (C. & E. M., July, 1938, pg. 19). The strip of land on which clearing was started last May and which has now been graded is 1.24 miles long and extends through a deep canyon, with steep sides, where the spruce and hemlock grew to as much as 10 feet in diameter and the cedars even more. They cut one tree 13 feet through, and ring counts showed trees over 700 years old. On the whole, the place was a jungle and almost inaccessible.

Quite a number of portable outfits of one kind and another were necessary, as well as pieces of stationary equipment of special design to meet the conditions. A. E. DuMont was willing to explain some of them.

Boring Machine for Log Burning

A unit generator, having a total weight of about 400 pounds, was assembled and mounted on handles of welded pipe. A General Electric 1½-hp motor was used, driven by a Briggs & Stratton 4-hp gasoline engine. This furnished current in the field for the operation of a Sioux ¾-hp electric drill. The boring crew also carried 50 to 100 feet of electric cable, to permit operating the drill some distance from the generator.

Logging fallers went ahead first and felled the trees, high cutting them and then going over and low cutting the stumps down to below grade. Holes were bored in the logs with ½ to 2-inch augers operated by the drill. The number of holes per log varied with the size. A log 6 feet in diameter, for instance, would probably require holes about 8 feet apart and staggered on two sides of the log, each hole being bored to the center. The boring crew could average about a hole a minute.

Another crew then came along and loaded these holes with one to two pounds of Giant black stumping powder per hole. These loads were individually fired with fuses lighted in suc-

(Continued on page 18)

Huge Aquarium in Florida For Denizens of the Deep

Marine Studios of Concrete And Steel Feature Novel Construction and Will Aid Scientific Research

(Photos on page 36)

✦ ON Anastasia Island south and east of St. Augustine, Fla., at Marineland, an interesting piece of engineering design and construction has recently been completed in creating the world's largest aquaria with clear salt water in its huge pools and over 200 portholes in the sides and bottoms of the tanks through which visitors and scientists can observe and photograph the life of the fish and aquatic mammals as they move about in the clear waters. These are the only tanks specially designed for underwater motion pictures.

The aquaria consist of two tanks, one a 75-foot diameter steel tank lined with Gunitite and having 11 feet of water in which a mother porpoise and baby disport themselves, a 14-foot 8½-inch sawfish swims lazily about, a quintet of penguins strut and clown and two seals have learned already to attract the visitor by their antics. The second large tank, also of steel and concrete, is rectangular, and is 100 feet long, 40 to 50 feet wide and 18 feet deep in the central portion, with shelf-like ends, one covered with natural rock and the other with several tons of coral, providing the small fish with natural hiding places from their enemies who will also live in the tank. Between the two is a flume into which the specimens are delivered by a special tank from the Porpoise, the collecting trawler. The cylindrical tank with an aeration device is carried aft in the hull of the trawler and the fish placed in it as caught. Then the tank is removed from the trawler and carried across the road to the derrick mounted at the side of the flume and raised to the edge of the water and the specimens released.

Steel Tank Construction

Originally planned for concrete construction, the tanks were changed to steel construction because the walls would be thinner and thus permit greater angular vision from the portholes. The steel tank is protected from the action of the salt water by being lined with a 2-inch coat of Gunitite applied by the conventional pneumatic guns. Both steel tanks are electrically welded and suspended on steel I-beams so that floor ports can be constructed at any

later date for the observation of the water life from below. Already two lines of ports have been constructed of Tuf-flex glass only ⅝-inch in thickness in the bottom of the larger tank through which still and motion pictures can be taken. Each pane of this glass is protected on the inside by the insertion of an ordinary glass panel in the same frame so that visitors cannot damage the more expensive glass by scratching. The inner panels of glass can be replaced by the removal of a few bolts without emptying the tank and can be taken out quickly when scientific motion pictures are to be made.

Wellpoints for Water Supply

In order to make the aquaria successful it is absolutely necessary that the water be crystal clear. Sea water is constantly circulated through the tanks and is supplied by three American Marsh pumps of 3,000-gpm capacity, drawing water from the ocean through a natural filter bed of coquina rock about 5 feet below the surface of the beach. A 12-inch cement-lined cast-iron intake pipe was laid from the shore on a trestle for 200 feet with three laterals leading to 9½-inch diameter x 10-foot long wellpoints. The entire



The Start of Construction at the Marine Studios, Marineland, Fla.

length of suction pipe is 495 feet.

Upon the completion of the line the trestle was removed, leaving the suction line just beneath the surface of the beach. The wellpoint system is supported by a group of 40 concrete piles jacked and driven into the coquina formation. These piles are 12 feet long, 10 inches square at the tip and 12 inches at the butt with steel reinforcing. The suction line is welded to the reinforcing steel of the piles.

Care of the filter points in the wells requires backwashing at times to free the points of obstructions. As the head on the filters is 27.5 feet when the tanks are full, by manipulating the valves the full pressure of the tanks may be

(Continued on page 9)

Contractor Produces All Aggregate On Job

Lane Construction Corp. Had Two Pits for Hot-Mix and Concrete Aggregate on 6.83-Mile Highway in Maine

(Photos on page 36)

✦ BUILDING the 6.83-mile cut-off on U.S. 201 between Brunswick and Augusta, Maine, in the towns of Bowdoin, Bowdoinham and Richmond, the Lane Construction Corp. of Meriden, Conn., used a hot-mix plant that has served it faithfully for 22 years, and also produced all the aggregate for both the bituminous concrete surface and for the concrete base, with the exception of the ½-inch stone for the hot-mix, from two pits.

The Concrete Aggregate

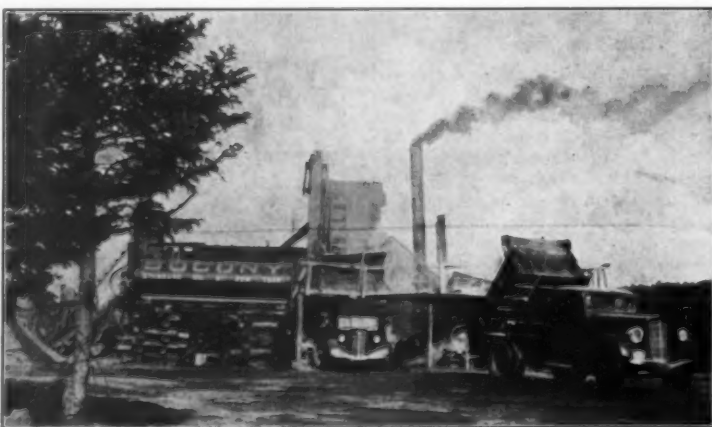
The first big job on this contract was to produce the aggregate required for the concrete base. Lane opened a large

sand and gravel pit at about the middle of the job and produced the aggregate, crushed, washed and screened as required. In the pit a Bucyrus-Erie 7½-yard steam shovel loaded the material to a pair of Ford V-8 shuttle trucks which dumped onto a grizzly. The material dropping through went directly to the scalping screen, a cylindrical unit, while the oversize was carried to the No. 11D Acme jaw crusher driven by a Fairbanks-Morse 80-hp diesel engine. The crusher-run material was delivered to the same bucket elevator that carried the fines to the scalping screen operated in connection with the Good Roads washing plant. The material was screened into two bins: sand, and material from ¼ to 2¼-inch screen size.

Water for the washing plant was secured from several sources. The largest source was a pond 2 miles distant where a Barnes triplex road pump was used, delivering to a 2½-inch pipe. This water was delivered to a small pond about 1,100 feet from the washing plant where a Barnes 4-inch centrifugal pump delivered the water to the plant. Another triplex pump 1½ miles away delivered to the same small pond to augment the supply. The wash water was wasted to the pond 200 feet from the plant. The plant was operated 10 hours daily to furnish the concrete aggregate only. The finished aggregate was delivered wet to a large storage bin above the batching plant.

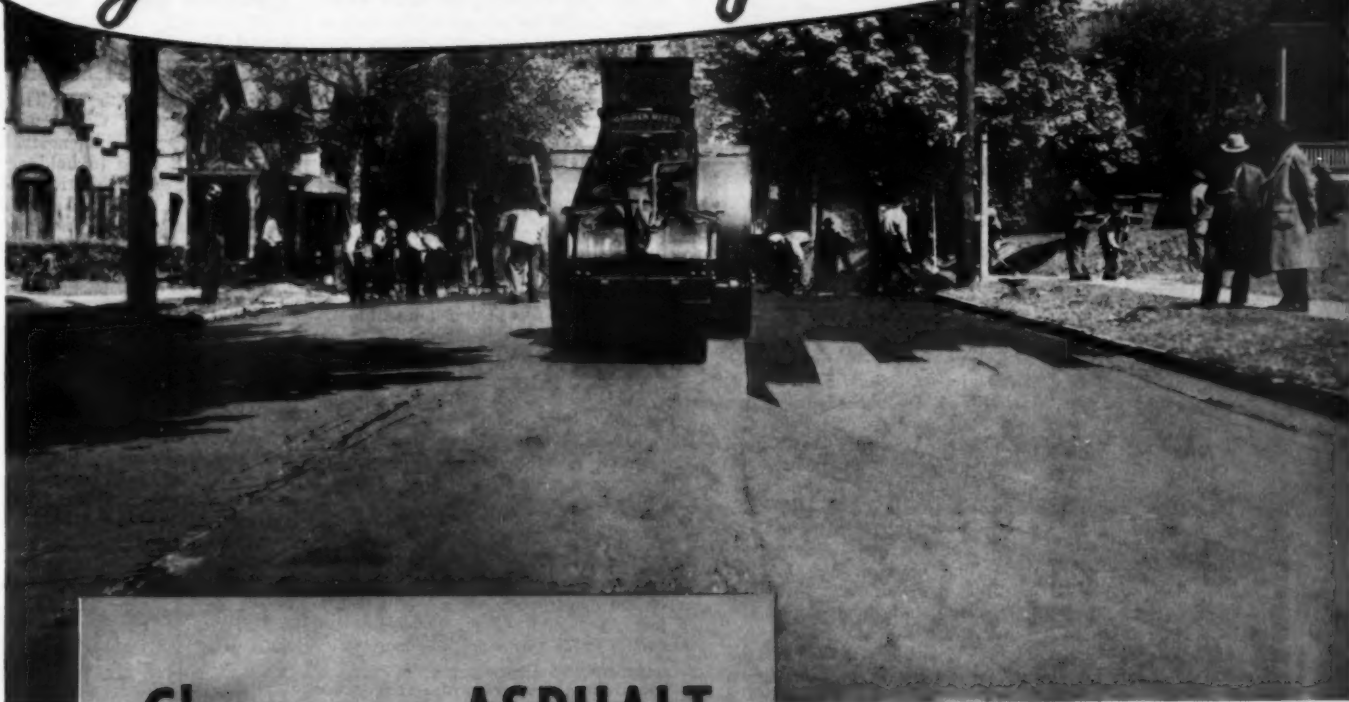
Cement for the concrete was furnished by the Lawrence Portland Cement Co. from its Thomaston, Me., mill by freight to Bowdoinham, Me., where it was unloaded by a Blaw-Knox screw-conveyor and bucket-elevator system to a storage bin and then hauled by covered trucks to the separate Blaw-Knox cement-batching plant on the road leading in to the aggregate-producing plant.

(Continued on page 28)



C. & E. M. Photo
The 22-Year-Old Cummer Asphalt Plant As Set Up for Producing Hot-Mix Top for the Lane Construction Corp. Contract Between Brunswick and Augusta, Maine

Ways to win the Engineer's confidence



**Choose an ASPHALT
he has known
a third of a century**

Some facts about a road or street job carry great weight with the engineer. For example, the Asphalt which the contractor selects for the job.

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More Effective Snow Plowing

In clearing snow from our highways there are two schools of method with but a single thought—plow as quickly as possible. "Immediately" is the word for it where traffic is heavy and the state, county or town department is adequately equipped. On the other hand, there are many sections of the country where traffic is sparse and hence immediate plowing is not absolutely necessary, distances are great and equipment less per mile of road to be cleared. In these sections, highways are cleared in order of their importance, with the aim of clearing them all as promptly as possible.

Vermont is an example of a state with quite heavy year-round traffic and a considerable fall of snow, from 50 to 100 inches each winter. They choose to use a large fleet of light trucks with one-way plows, operated at relatively high speed over short routes to keep the roads clear of snow. Both the state and the towns own a minimum of heavy equipment.

In the middle west and northwestern states, heavier equipment is generally the rule because the routes are longer per piece of equipment and traffic not as heavy. The big V plows and rotaries handle the deeper snow effectively and

toward the end of the winter the plowed surface of the roads is widened out to permit proper drainage. There has been a noticeable tendency on the part of county and state highway departments in these sections to buy more and more powerful trucks and larger and larger snow plows. Would it not be more efficient and provide more effective plowing if the trucks were increased in power but the plows kept the same size? It is the power behind the plowing unit that determines whether it gets through, and simply piling up greater and greater weight and mass in the larger plows and the volume of snow they handle just magnifies the problem.

This is a study in economy and efficiency which should be made by each highway department before making additional purchases of plowing equipment. The interests of taxpayer, highway user, highway department and manufacturers of trucks, tractors and plows are bound up in the solution of this problem, as each wishes to see the greatest effectiveness of equipment as indicated by roads promptly opened to their maximum traffic width at reasonable costs and without breakdowns of equipment.

PREPARATION NOW TO HANDLE WINTER'S SNOW AND ICE WILL DECREASE NEXT YEAR'S MAINTENANCE COSTS



Road Work for 1939-41 Set at Billion a Year

Although the amount of Federal Aid authorized for 1940 and 1941 is not as great as that of 1938-1939, the carry-over of \$150,000,000 should bring the total amount of highway work to be done during the next three years close to the same general average.

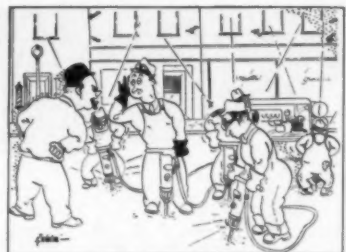
According to the statistics of the various state highway departments, the 1938 program will be about the same as 1937. At this time the principal factor which might change the picture is a reduction in highway revenues, although the estimated highway revenue for the first four months of 1938 is approximately 4 per cent greater than for the same period in 1937.

The current Relief Bill carries a \$750,000,000 appropriation, which will be administered as before on a 45-55 per cent basis. This appropriation, with the 55 per cent more to be furnished by the applicant for public works, makes a total of \$1,162,500,000. Based on previous PWA applications, approximately 22 per cent of that sum will make available \$255,750,000 for the street and highway program for the fiscal year 1938-1939.

Taking into consideration all the available funds for highway work, the American Road Builders' Association estimates that the highway program for the next three years will average approximately \$1,000,000,000 a year.

One of the plans for modernizing the Bombay-Poona Road in India consists of the construction of a 9-foot center lane of asphalt or tar macadam and two 7 1/4-foot side lanes of concrete.

Proper Road Drainage Is One of the Most Important Considerations in Winter Maintenance. Upper Left, Thawing Ice from a Culvert with Steam to Insure Free Drainage. Bottom Left, the Consequences Suffered by Road Surfaces When Snow Water Is Not Carried Away from the Surface into Side Ditches. Right, In Many Sections, the Sanding of Icy Pavements Is the Major Operation in the Winter Maintenance Program. Below, Snow Removal Equipment Ready for Action at a Regional Equipment Depot of One of the State Highway Departments. (All U.S.B.P.M. Photos.) Bottom Right, a Second Plowing to Clear the Roadway to Its Full Width.



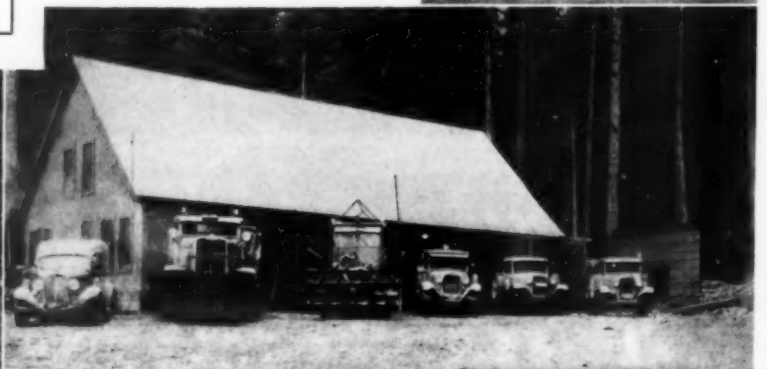
"Which One of Youse Guys Started a Whispering Campaign Against Me?"

Road Machinery Exhibit To Be Held in Chile

In connection with the Third Pan American Highway Conference to be held in Santiago, Chile, next January, it has been decided to hold an International Highway Exhibition under the auspices of the Chilean Government to begin in December and last from 45 to 60 days, a part of this time to be concurrent with the Highway Conference.

The Chilean Government has extended a cordial invitation to manufacturers of American road-building equipment to participate in this exhibition, with the hope that such participation may increase the purchase of such equipment by the countries represented at the Conference.

A booklet containing the regulations and giving full information about the exhibition has been prepared and copies may be secured from the Bureau of Foreign and Domestic Commerce, Washington, D. C.



Low-Cost Road Job Was Well Organized

Road Mix with RC-2C and Dense Graded Aggregate Was Completed in Arkansas By Uvalde Constr. Co.

By FRANK B. SARLES, Former Area Construction Engineer, Arkansas State Highway Department

(Photo on page 36)

THE result of a well-planned and carefully equipped organization was evident during the summer of 1937 on the construction of a 27-mile road-mix surfacing job between Fordyce and Sheridan, Arkansas, by the Uvalde Construction Co. of Dallas, Texas.

The project lay on an existing gravel road and the preliminary grading, which consisted principally of lowering the grade over several hilltops to increase sight-distance, was done with a Thew-Lorain 75 1/4-cubic yard shovel and Ford and Chevrolet trucks hired on the job.

Gravel Base Course

After the grading was completed the existing gravel surface, where it had not been obliterated by the grading operations, was lightly scarified and bladed to a true and uniform surface, additional patch gravel being added in small amounts where necessary to improve the cross-section and profile. The gravel base course was then placed with the same equipment used for grading from several gravel pits scattered close to the line of the improvement. An average of better than 2,500 cubic yards per day was placed, using all available daylight hours. The number of trucks used varied with the length of haul. Base gravel meeting the following specifications is plentiful throughout this section of Arkansas and the contractor was able to load direct from bank to trucks without screening or crushing.

Grading Specifications For Gravel Base Course	
	Per Cent
Passing a 1 1/4-inch square screen	100
Retained on a 3/4-inch square screen	0-30
Retained on a No. 4 square screen	40-75
Passing a No. 200	0-30

The gravel was hauled in 3-cubic-yard loads and then spread 30 feet wide and approximately 8 inches thick, loose, with an Adams No. 12 blade pulled by an Allis-Chalmers SO tractor. During the early part of the job it was placed in one course but toward the end the contractor elected to place it in two courses to expedite compaction.

The base course was maintained constantly while under traffic during the compaction period, from one to three pneumatic-tired patrol-graders being used for the purpose. Most of the base set up satisfactorily under this procedure but some of that placed in the later stages of the job was sprinkled with from 50 to 100 gallons of water per cubic yard and rolled with heavily loaded trucks on pneumatic tires. Although compaction requirements in Arkansas are more rigid than usual, no delay was experienced in the placing of the top due to lack of compaction and the cross-section and riding surface obtained was exceptionally good.

Priming

After sweeping the compacted base with a Grace rotary broom to remove dust and loose particles, priming was done immediately, an MC-1 asphalt being applied for this purpose at the rate of 0.25 to 0.30 gallon per square yard. A Littleford Model CT-10 distributor with a capacity of 1,050 gallons, mounted on an International truck, was used with a spray-bar 21 feet long. It was found necessary to increase the opening in the outside nozzles slightly in order

to obtain a uniform distribution with the long spray-bar. Asphalt was applied at a temperature of 140 degrees. The prime was permitted to cure, without traffic, for an average period of three days until all tackiness had disappeared.

Mineral Aggregate

The grading specified for mineral aggregate was as follows:

	Per Cent
Passing a 1 1/4-inch screen	100
Retained on No. 4 screen	30-60
Retained on No. 10 screen	40-75
Passing No. 200 screen	3-14

It was found possible to secure aggregate complying with this grading from pits adjacent to the project but in some cases blending of materials from different parts of the pit was necessary. This was done by dumping one class of material along the top of the face being



The Distributor Followed Closely by a Truck with an Offset Broom Pulling the Preliminary Mixing Drag with a Double Set of Flows

worked and mixing with the same shovel used for loading. This delayed progress somewhat but it was still possible to produce mineral aggregate faster than it was required for the rate of progress set

up as the most economical. Mineral aggregate was loaded and hauled with the same equipment previously used for base-course gravel. It was dumped on

(Continued on page 19)

NEW HEAVY-DUTY 13-TON CAPACITY TRUCK CRANE

Here's a machine that's right down the alley of you steel erectors, bridge builders, and sewer contractors. It's the new heavy-duty 13-ton Universal-Lorain truck crane. And look what it offers! Increased capacities; stand-and-boom equipment up to 80 ft. in length (longer with tip extensions) featuring all-welded construction for greater strength and pin-connected splices for easy and speedy assembly; and a steel erector's precision boom hoist with power-controlled boom lowering.

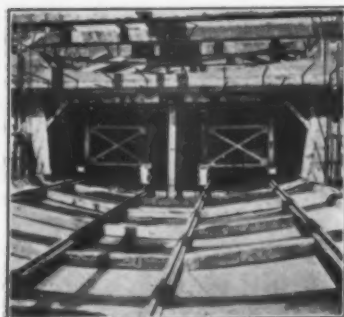
This new 13-ton unit is a typical Universal-Lorain value. Built by the manufacturer who originated the truck crane idea, this new model represents continuation of 20 years' leadership in this specialized field.

Write today for new catalog describing truck cranes and their many money-making applications.

**UNIVERSAL CRANE DIVISION
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ALL-PURPOSE UNITS—The Universal-Lorain line includes truck cranes and shovels of a size and type to meet the all-purpose needs of every general excavating or highway contractor, state, county, township, or city. Such general purpose truck cranes are offered in 5½, 7, 7½ and 8½-ton capacities while truck shovels range from ¾ to ¾-yd.

LORAINS



A View of the Lower Section of the Sewer, Showing the Steel Forms and the Pair of Counterweighted Travelers

Unusual Methods for Sewer Construction

The construction of a twin trunk sewer now being laid in the Borough of Queens, New York City, has resulted in the development of a new method for this type of work, requiring special steel forms and individual wheeled carriers for the form sections. This sewer, which when completed will be 3,400 feet long, will serve as an outfall storm-water and sewage drain along the east side of the World's Fair site. The Blaw-Knox Co. of Pittsburgh, working with the contractor, Tully & Di Napoli, New York City, designed the forms and devised the operating methods.

The sewer contains an upper and lower barrel, the lower barrel measuring 22 feet wide x 8½ feet high, and it was the construction of this lower section which required the development of new equipment and handling methods. To get the utmost use of the forms, it was necessary to remove the forms as soon as possible after pouring. In order to do this, it was found necessary to erect a row of supporting shores on the vertical center line of the sewer, and because of the weight of the arch and floor of the upper barrel, to allow these shores to remain in place several days after the removal of the concrete forms. As a result the forms had to be fabricated in half sections and individual carriers provided for moving each section.

In constructing the carriers, provision was made for the stabilization of the weight of the form sections by counterweighting the travelers, since they were forced to carry the forms in an unbalanced fashion, the vertical or side portion of the form hanging outside the traveler wheels. Perfect alignment and easy collapse of the form halves was accomplished by mounting the section on the traveler in such a manner that the operation of four members adjusted or collapsed the section. Anchor jaws on the side portion of the forms grasped a turnbuckle rod and a steamboat ratchet, both of which were pivotally fastened to the traveler. Operation of the ratchet similarly operated the top slab of the form, and was so mounted that its pivotal end caused the form to swing forward toward the shoring into the proper position on the traveler when the forms were collapsed.

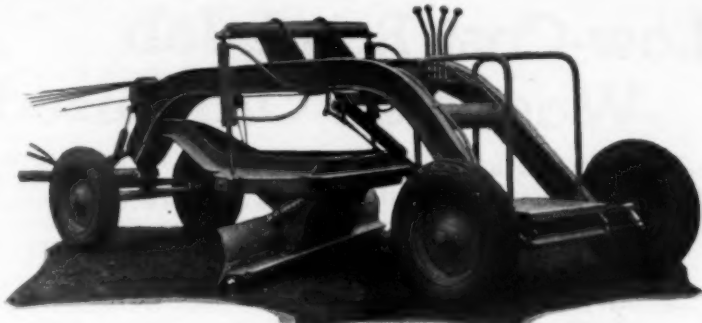
New Grader Maintainer And Construction Unit

The new Good Roads 55 grader, recently announced by the Good Roads Machinery Corp., Kennett Square, Penna., is designed as a maintainer grader equipped for one-man operation, with full power hydraulic control, for use with wheel and track-type tractors of medium size. In addition, this unit is strong and flexible enough for ditching work and other construction jobs, and for this purpose is provided with a second set of power hydraulic controls and an operator's platform. From this platform the operator has an unobstructed view of the blade, and instan-

taneous control over raising, lowering and side-shifting the blade, and side-shifting the grader on the rear axle.

A new feature of the Good Roads 55 is the design of the circle. The large-diameter concentric steel plates are flanged and fitted one inside the other. The larger outside plate is welded to the drawbar; the smaller turns easily inside the larger, yet is closely fitted and firmly held to prevent chattering. The moldboard is attached to heavy steel plates welded to the inner circle. In tests and under varying working conditions, this construction has proved to be exceptionally strong, eliminates chatter and provides easy adjustment of the blade angle, according to the manufacturer.

The main frame is constructed of heavy channel side members with tubular cross members and is electrically welded throughout. Concentration of weight over the blade and the long wheelbase are designed to insure smooth grading action. The wheels are of solid cast iron with large heavy-duty pneumatic tires which offer maximum resistance



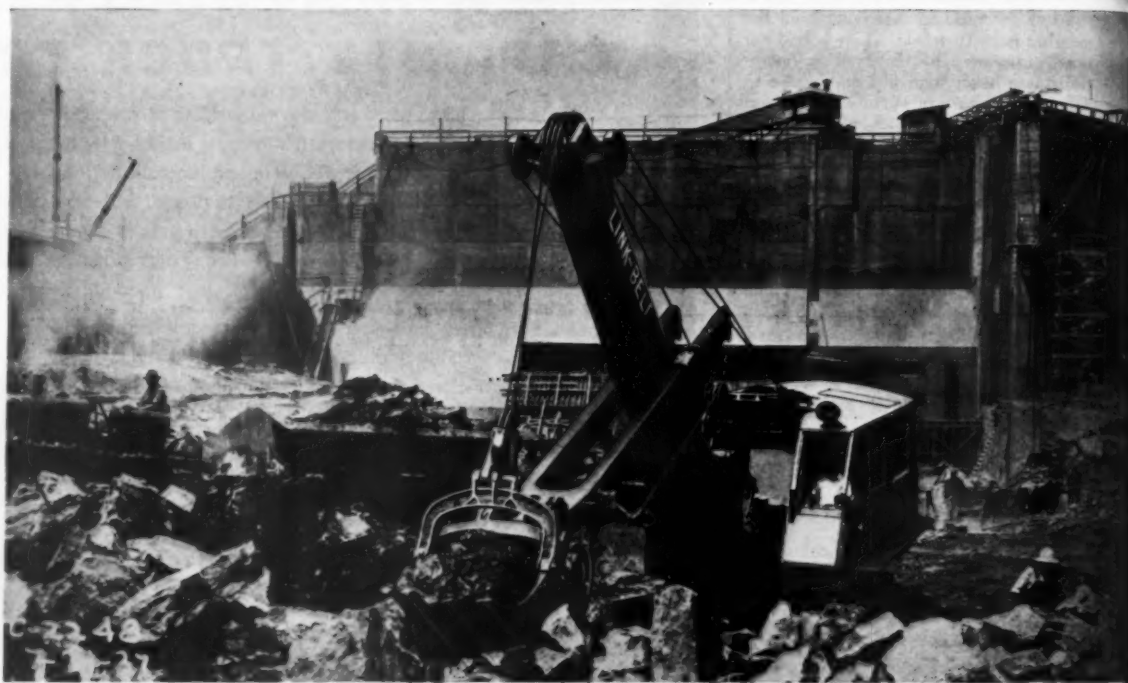
The New Good Roads 55 Grader

to side skidding. The moldboard is of strong construction, reinforced with a heavy railroad rail hot-riveted in place and is secured to the circle with adjustment for varying the pitch to suit different types of work. For heavy grading an 8-foot blade may be used and for patrol maintenance blades up to 16 feet. The control levers are located on the

rear platform, with optional extension controls mounted on the tractor for one-man operation.

Complete specifications of this new Good Roads 55 are contained in an illustrated bulletin, copies of which may be secured direct from the manufacturer by mentioning CONTRACTORS AND ENGINEERS MONTHLY.

Don't Let Your Profits Pay the Price



Above: "TOUGH GOING"—this work of excavation for spillway of Chickamauga Dam (T.V.A.)—and yet not particularly hard for this Link-Belt K-45 Speed-o-Matic Diesel chain crowd shovel. As one on-looker has said, "It's a darn good machine, and a big improvement over the old type."



Development of Link-Belt Speed-o-Matic control puts manual-lever-operated shovels back in the class with automobiles you had to crank by hand.

Today you push a starter button in your car, drive farther and feel fresher at the end of the day. With the Speed-o-Matic control and its twist-of-the-wrist levers, you make more dirt "go places" all day without fatigue.

LINK-BELT

New Material Bucket For Truck Mounting

The new Brooks Load Luger, recently announced by the Brooks Equipment & Mfg. Co., 408-10 Davenport Road, Knoxville, Tenn., is designed for use in transferring stone from rock quarry to crusher, for hauling concrete aggregates, for sewer or trench excavation, and for hauling and transferring any material which is loaded by hand.

The Load-Luger buckets are made in one piece, and carried directly on the rear of the truck. No counterweight is required. The Luger has direct drive from the power take-off to the hydraulic pump hoist assembly and requires no high-pressure-hose connections. The hoist used is hydraulic and positive in both up and down motions. The bucket, which has guides on the bottom to prevent side sway, dumps instantly, without leaving the truck if desired.

Complete information on this new unit may be secured direct from the manufacturer by mentioning this magazine.



The New Brooks Load Luger

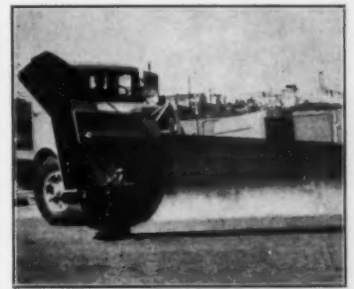
A New Type of Hoist

The new C. H. & E. No. 30 Hitch-Hiker hoist, as well as the small single-drum C. H. & E. hoists, is described in new literature recently issued by the C. H. & E. Mfg. Co., 3849 No. Palmer St., Milwaukee, Wis. The Hitch-Hiker, claimed by the manufacturer to be an

entirely new development in the hoisting field, consists of two winch heads driven through an enclosed worm gear reduction by a gasoline engine or electric motor.

The Hitch-Hiker is operated by wrapping the hoisting rope several times around one of the winch heads. To raise the load, the free end of the rope is pulled tight, causing the rope to snub on the winch head. As the load is raised, the operator pulls the free rope toward him. The load can be stopped and held at any point by slacking off on the rope so that it slips on the winch head. The wraps of rope around the winch head acts as a positive clutch and brake. To lower the load the rope is slacked off and let out by the operator. The capacity of this hoist is 600 pounds at a speed of 75 feet a minute on the small winch head or 400 pounds at 115 feet a minute on the large winch head.

The new literature on these C. H. & E. hoists may be secured by those interested direct from the manufacturer by mentioning this magazine.



The Rotoblade

Snow Plow Combines Rotary and Blade Types

A new snow-removal unit, combining the speed of the blade-type plow and the effective snow-removing qualities of a rotary-type plow, has been developed and was first put into operation last winter by the Snow Removal Equipment Co., 400 Seventh St., San Francisco, Calif. This unit, which can be mounted on or detached quickly and easily from any make of truck, can be used for eliminating the snow from the highway in one operation or can be used in combination with blade plows by following and removing the snow from the highway as it is pushed to the side by the blades. This unit throws the snow a distance of 50 feet or more from the roadway.

The unit consists of a 3/16-inch high-carbon steel moldboard, 42 inches high and 8 feet long, reinforced at the top and bottom and ribbed vertically on the back, at the outer end of which is a rotor. This rotor is 42 inches in diameter, with six blades 12 inches wide. The rotor shaft is of 2 3/4-inch special nickel steel for low temperatures. The Rotoblade is equipped with SKF ball bearings throughout. Connected to the rotor is a chute through which the snow is passed and thrown from the highway. Power for the rotor is furnished by a Ford V-8 truck engine, equipped with the new McCulloch supercharger producing 110 hp, and with electric starter controlled from the truck cab. The engine is set at the left side and is built into the main plow frame. A Ford truck transmission and clutch are used with heavy-duty gears providing two speeds of the correct ratio for the rotor speeds required. These gears are interchangeable with the standard Ford gears. The drive shaft is mounted on two SKF ball bearings and connected with a universal joint. Two strands of double 1-inch pitch roller chain are used from the drive shaft to the jack shaft and from the jack shaft to the rotor shaft. The entire transmission is housed and runs in an oil bath.

The plow is attached to the truck by a special pivot axle device, the patent for which has been applied for. Either end of the blade may be elevated 8 inches without placing any undue strain on the truck frame or the springs; the entire thrust is taken on the truck channel frame. Blackhawk remote control is used for lifting the blade.

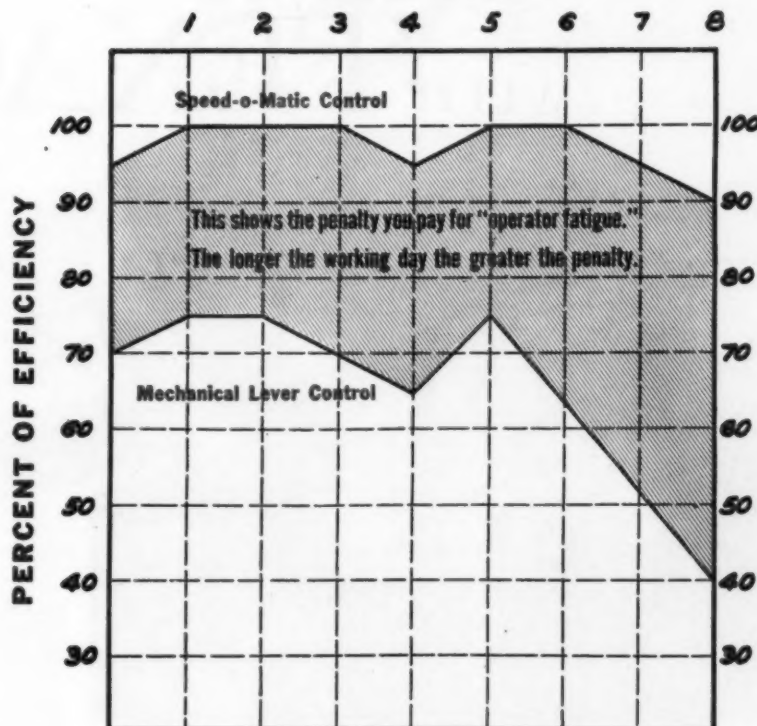
Literature describing this Rotoblade may be secured direct from the manufacturer by mentioning this magazine.

Diesel Prices Reduced

The Caterpillar Tractor Co., Peoria, Ill., announced on June 20, 1938, liberal price reductions in its line of track-type tractors and diesel engines. The reductions in the tractor line affect all sizes except the Twenty-Two, the price of which had already been reduced \$200 several weeks earlier. The reception which met this announcement encouraged the company to make similar reductions in the prices of other of its products, the reductions ranging from \$150 to \$650 on the several sizes of tractors and from \$175 to \$750 on the diesel engine line, affecting six of the eight current sizes of Caterpillar diesels.

the Penalty of Operator Fatigue!

WORKING HOURS



The levers and pedals of the conventional mechanical lever control system have a long, hard throw, requiring an extremely fatiguing shoulder motion and maximum hip action. This inherently slower operating speed and excessive physical effort are the limiting factors in production, and definitely rob the machine of a substantial part of the output of which it would otherwise be capable.

The top curve of the chart shows the much higher maintained efficiency of the Link-Belt Speed-o-Matic machine.

● "In all of your literature, the fatigue time that you advertise between 8 o'clock in the morning and 4 o'clock in the afternoon, is absolutely correct. I have timed our Link-Belt K-480 Speed-o-Matic day after day, and have found the same number of passes per hour between 8 and 9 in the morning as between 4 and 5 in the afternoon, by the same operator."—R. W. Helmle, Master Mechanic, Utah Construction Company. Send for Book No. 1795.

LINK-BELT COMPANY, 300 W. Pershing Road, Chicago

Distributors and Offices in Principal Cities

7473

Visitors are always welcome at our Chicago Plant testing grounds to witness demonstrations of Speed-o-Matic machines.

Speed-o-Matic

SHOVEL DRAGLINE - CRANE



The New Byers Model 83 Shovel

New 3/4-Yard Shovel

The new Model 83 3/4-yard shovel, made by the Byers Machine Co., Ravenna, Ohio, was first displayed at the Road Show in January and since that time has been operating continuously on a variety of test jobs.

On the Model 83, line and swing speeds have been stepped up to increase the number of digging cycles a minute. More power per pound of weight is employed. Preformed rolled steel construction provides the strength to handle safely the extra power. Other features are lighter weight, long boom and dipper sticks to increase shovel working ranges, and over-size clutches and brakes.

Power is furnished by a 72-hp gasoline or diesel engine. Chain or cable types of shovel crowd are optional. The boom and dipper sticks are of preformed rolled steel construction, the same as the main revolving frame, carbody and crawler side bolsters. The deck machinery is balanced far back of the center line of rotation and boom loads and swing strains are absorbed by four hook rollers which ride on a roller path of wide diameter. The crawler treads are 20 inches wide and of the single driving lug self-cleaning type.

New Air Compressors

Three new light-weight portable air compressors have recently been added to the I-R line of pneumatic equipment made by the Ingersoll-Rand Co., 11 Broadway, New York City. These three units are designed for balance of weight, have rigid construction throughout and can be towed at speeds up to 35 miles an hour.

Features include leaf-type spring mountings, Timken roller-bearing wheels

with either pneumatic or solid tires, hinged covers, and tool boxes built into the mounting. Models 85A and 105A have the I-R two-stage air-cooled compressor with either gasoline or oil engine and Model 55 is a single-stage air-cooled unit driven by a gasoline engine.

The smallest of the three units, Model 55, delivers 55 cubic feet of air a minute at 80 pounds pressure, sufficient to operate a small jackhammer or paving breaker. The Model 85A, which delivers 85 cubic feet of air a minute at 100 pounds pressure, can operate the medium-sized jackhammers or two paving breakers, while the largest model, 105A, rated at 105 cubic feet a minute at 100 pounds pressure, will operate the largest jackhammer or three paving breakers.

Self-Aligning Belt Idler

A new idler for automatically training conveyor belts without damage to the belt has been announced by the Jeffrey Mfg. Co., Columbus, Ohio. This unit consists of a standard anti-friction idler

pivotaly mounted on a supporting cross member with guide rolls at each end. These guide rolls are mounted on pivoted arms that extend at right angles to the idler in the direction from which the belt approaches. The arms are held in place by an easily removed locking pin. By swinging the arms through 180 de-

grees and putting the lock pin in place on the opposite side, the guides are made ready to train the belt when traveling in the reverse direction. The guide roll moves outwardly the instant the belt touches it, and in so doing swivels the idler sufficiently to cause the belt to return to normal position.



MALL Concrete Vibrator with Gas Engine Power Unit

INCREASED PROFITS FOR YOU with

MALL CONCRETE VIBRATORS!
Operate at 5000, 7000, and 10,000 r. p. m.

Every penny cut from concrete placing expenses means more money in your pocket. By using MALL concrete vibrators you secure a better quality of concrete at reduced labor and material costs. The concrete is placed firmly against the forms and reinforcing steel, and voids and aggregate pockets are eliminated.

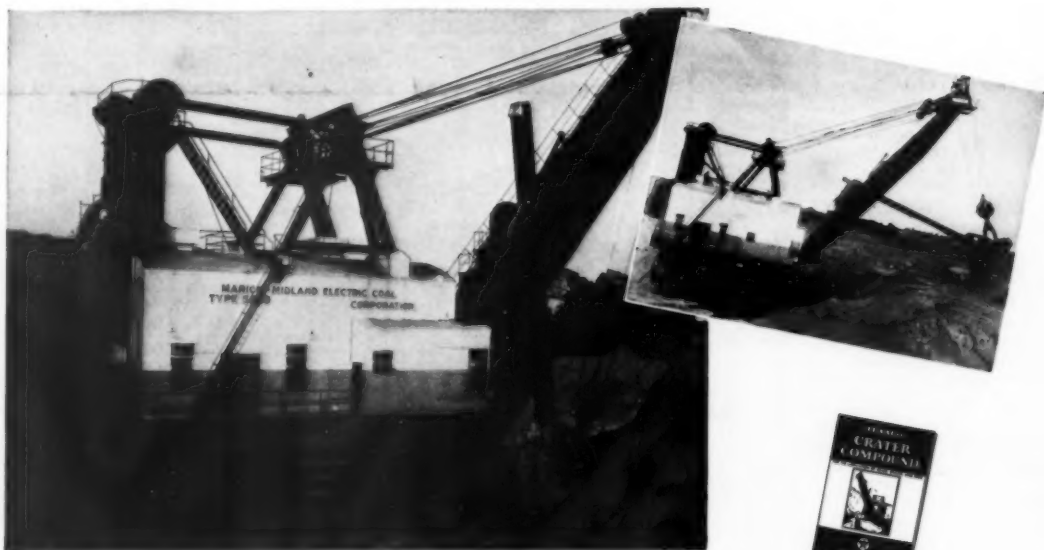
After you remove the forms you can finish or surface the concrete with the same power unit, thereby securing double duty from your initial investment.

A descriptive catalog on the various models will be sent upon request.

MALL TOOL COMPANY

7743 South Chicago Avenue Chicago, Illinois
OFFICES AND DISTRIBUTORS IN ALL PRINCIPAL CITIES

A 27-ton Bite... WITH TEXACO



Built for the Midland Electric Coal Corporation, this Marion shovel originally swung a 20 cu. yd. dipper. In October, 1937, the capacity was increased nearly 40% by installing a 27 cu. yd. dipper. This shovel is self-leveling, moves under its own power on a series of crawlers with overall width of nearly 42 ft. A complete plant in itself. Six different Texaco Lubricants are in regular use.

FREE BOOKLET. 32 pages of money-saving information on the lubrication of gears and wire rope. Shows where to use Texaco Crater Compound, and how. Illustrates simple, easily built rigs for quick application. FREE for the asking.

TAKING 27 CU. YDS. AT A "BITE," this giant shovel in the Midland Electric Coal Corporation's plant at Middle Grove, Ill., handles an overburden averaging 35 ft. in thickness.

This huge Marion is one of the world's largest strippers... 95-ft. boom... 60-ft., 3-in. dipper handle... powered by 5 motors aggregating 900 h.p. Since the day it was installed it has been Texaco-lubricated 100%.

On all open gears, Texaco Crater Compound

cushions the gear teeth, and protects against abrasive wear. It clings to tooth surfaces at high speeds. Resists highest temperatures and pressures... and lasts several times longer.

Telephone your local Texaco warehouse plant for a Texaco representative to call. There are 2108 of these warehouses in the United States, assuring prompt delivery.

The Texas Company, 135 East 42nd Street, New York City.



TEXACO

Crater

COMPOUND

"We know THERE IS NO OTHER MACHINE as Accurate"

A member and secretary of a County Road Commission in Michigan reports this way after using The Buckeye Surface Material Spreader for sand, pea gravel, crushed stone and gravel up to one inch—says "it handles each perfectly."

QUOTED STATEMENTS
are authentic—on file the original reports received from users for proof of quotations used in our advertising.

Write now before you invest in material spreading equipment.

Buckeye Surface Material SPREADER

BID THE Buckeye WAY
ask for our operation data before you bid

THE BUCKEYE TRACTION DITCHER CO.
FINDLAY, OHIO

New Sodium Lights For Highway Bridge

Lincoln Highway Span Across the Mississippi River and Approach On Iowa Side Now Lighted for Heavy Night Traffic

(Photo on page 36)

THE Lincoln Highway, as it crosses the Mississippi River from Fulton, Ill., to Clinton, Iowa, carries a large amount of traffic which is daily increasing in intensity. Heavy inter-state bus and truck traffic forms a large portion of this cavalcade and it seemed imperative that, during the hours of darkness, something be done to facilitate the safe movement of this traffic.

Therefore, the Lincoln Highway Bridge, owned by the Lyons & Fulton Bridge Co., and the recently completed approach on the Iowa side have been equipped with General Electric 10,000-lumen sodium vapor lights, installed according to the specifications of General Electric and Inter-State Power Co. engineers. These lights provide an intensity of mellow illumination which enables drivers to see far ahead without dangerous and discomfiting glare and also provides visibility when fogs settle on the Mississippi so that drivers may move with safety at more than a snail's pace.

Dr. E. L. Martindale, President of the Lyons & Fulton Bridge Co., and other officers of the company are looking forward with interest to the effect of this golden lighting system on the millions of bugs which heretofore were a menace and have caused much trouble on this structure. It has been observed by laboratory and field engineers that, while insects gather in great numbers around ordinary lights, they do not appear to be attracted to sodium lights. Some investigations which have been made indicate that the red end of the spectrum is least attractive to insects and the blue end most attractive.

In the business districts along the Mississippi, during and for several weeks after the hatching season, great quantities of bugs cluster around the lights, cling to the surface of the lights until they are either exhausted or singed, after which they drop off, making large piles all over the streets and

the bridges. While they cling to the lights, they obscure or dim the lighting and when they fall they create quite a problem, necessitating their removal and in the meantime causing a slippery condition on streets and bridges and a great annoyance to pedestrians.

Concrete and Steel Aquarium in Florida

(Continued from page 2)

brought on any wellpoint to flush out the obstruction.

The inflow and removal of the water from the tanks constituted a real problem. It was desired to give uniform flow through the tanks. The tank inlets are in the bottom, well distributed to prevent stagnant pockets. Eighteen inches below the surface of the water are a few inlets to give the water a slight flow around the tank so as to carry away to the discharge pipe any matter dropping onto the surface. The re-

moval of water and waste is in the central flume connecting the two large tanks and the water is taken out at the top, both to skim the surface of any precipitation and to remove the water that has heated under the semi-tropical sun of the Florida coast.

Development and Personnel

Marine Studios, Inc., has purchased a large tract of land on both sides of Florida Route 140 about 18 miles south of St. Augustine and 35 miles north of Daytona Beach for this development which also includes a restaurant, a service station, modern tourist cottages and a recreation pavillion. The work at Marineland is under the direct charge of W. Douglas Burden, President. Ilia Tolstoy is Vice President and Cornelius Vanderbilt Whitney is Chairman of the Board of Directors. Because of the interest in the construction and the novelty of the Marine Studios, the American Society of Civil Engineers visited the site following its quarterly meeting at St. Augustine in April, 1938.

PILE HAMMERS and EXTRACTORS HOISTS-DERRICKS WHIRLERS

Special Equipment
Movable Bridge Machinery

Write for descriptive catalogs.

McKIERNAN-TERRY CORP.
19 Park Row, New York

Distributors in Principal Cities

ON THE SIXTH HIGHEST BRIDGE

in the
U.S.A.

REX 160
PUMPCRETE
saved up to
\$1.50
PER YARD



"IT MADE HANDLING CONCRETE A PLEASURE"

Besides showing a net saving of almost \$1.50 per yd. by using the Rex 160 Pumcrete to pump 6500 yds. of concrete on their Port Arthur bridge job, the Beaumont Construction Company of Texas has this to report:

"The Pumcrete lived up to each and every thing we were told it would do; and we are pleased to state that the Pumcrete has not only saved us many dollars, but has also expedited our work and made handling concrete a pleasure... the Beaumont Construction Company recommends it."

Here the portable 160 Pumcrete proves its adaptability for still another type of concrete placement work. It can make big savings for you on your small underpasses, overpasses, viaducts, bridges, sewage plants, culverts, warehouses, etc. Estimate the cost of doing your job with the 160 before you place your next bid—see for yourself why it is fast becoming the country's leading concrete placement machine.

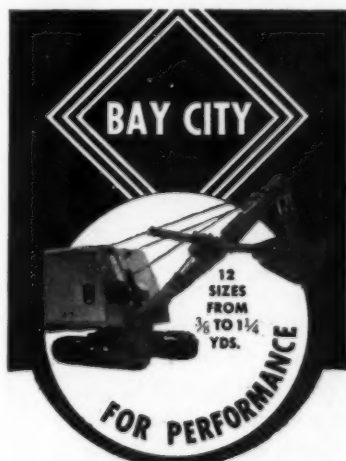


SEE WHAT THIS PORTABLE CONCRETE PUMP WILL DO FOR YOU!

Send for the new book "Presenting the Rex 160 Pumcrete." It answers all your questions about this new machine with facts and figures—shows exactly what it has done on many types of construction work. Send for it today. Use the handy coupon below.

CHAIN BELT COMPANY
1666 W. Bruce St., Milwaukee, Wis.
Please send me my copy of "Presenting the Rex 160 Pumcrete." I'm interested in buying ☐ renting ☐ a Rex 160 (check which).

Name
Street No. State
City
Co.'s Name
Position in Co.



BAY CITY Shovels, cranes and draglines, available in 12 models ranging from $\frac{3}{8}$ to $1\frac{1}{4}$ yards, both light and heavy duty machines, are noted for highest quality of workmanship, design accessibility, speed, economy, working range and safe load capacity. For more yardage at low cost investigate **BAY CITY**.

Write for new "COMPARE" booklet.

BAY CITY SHOVELS, INC.
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CHAIN BELT COMPANY OF MILWAUKEE

REX

PUMPCRETE



C. & E. M. Photo

Reinforcing for 50-Foot Piles Loaded for Hauling to the Casting Yard

Casting and Driving Concrete Bridge Piles

(Continued from page 1)

Then the two bars which formed the reinforcing in the two lower corners were dropped and the spiral tied. Eighteen-inch lengths of 6-inch pipe were inserted at several places along the cage to permit the four side bars to be pushed in easily without disturbing the spiral.

Four assembly lines were used with six men in each and each was within the space between two bents of the approach trestle.

The preforming of the wire spirals for the tapered end, the length of the pile and the driving head showed the ingenuity of the Superintendent in charge. A mandrel of four wings notched to receive the wire as it was fed to the revolving mandrel had the exact taper for the spiral when spread out although the operation was condensed into a mandrel only about 12 inches long. The mandrel was driven by a Novo engine mounted in a truck chassis with the power delivered through a clutch to a Ford rear end as a reducing gear. The mandrel had 21 steps to care for the 5-foot length of the taper. The 1/4-inch wire was delivered on the reel and placed on a vertical axis so as to revolve freely as the wire was unreel. In order to maintain a sufficient tension on the wire to bend it over the wings of the mandrel, a clamp near the reel was kept at a uniform tension by means of a spring. The feed of the wire to the pyramidal mandrel was done by hand by means of a small pipe slipped over the wire to protect the hands and gloves of the operator. The end of the wire was first bent over to form a hook and slipped into a hole at the top of the mandrel; then the winding proceeded with the guiding of the wire into the notches by hand. One operator was able to make the taper spirals for 200 piles a day and the full-length spirals for 50 piles. The mandrels for the full-

length spirals were collapsible to release the square spiral as soon as it was wound.

The 3 1/2-foot driving heads for the piles were made by placing four 7/8-inch deformed rods in the four troughs at the corners of a collapsible mandrel and slipping them under clips at the fixed end to hold them until the spiral was wound in the same manner as for the full-length spirals. It took 1/2 minute to wind the spiral around the dowels

and three minutes to electrically spot weld each turn of the spiral to hold it securely in place and prevent the spirals getting out of place during handling. The specifications did not require the spot welding of the rods and the operation was more expensive to the contractor than tying but the work was done during the shut down of other work and was an absolute insurance against delays due to the slipping of the spiral and the need for stopping concreting operations to make the adjustment.

The Casting Yard

Great care was taken to insure a good foundation for the casting yard. Over a roughly graded area 2 x 8's were laid and leveled by instrument. Sand was placed between the 2 x 8's to develop the full bearing under the 1 x 6-inch ship-lap lumber used for the floor which formed the bottoms of the forms for the piles. The 1 x 6's were securely nailed to the foundation lumber. Side forms of the same material were made with a 1 1/2-inch chamfer and assembled on the

casting floor. They were properly spaced and nailed to the floor and between the forms an open-type spacer 4 inches wide was placed which could be easily knocked down when the forms were to be stripped. Over each space was nailed a 1 x 6 plank to keep the concrete from being wasted between the pile forms instead of being placed within them and to tie the forms. The forms were oiled

(Continued on page 21)

TARPAULINS WRITE FOR SAMPLES AND PRICES

ROAD MATS

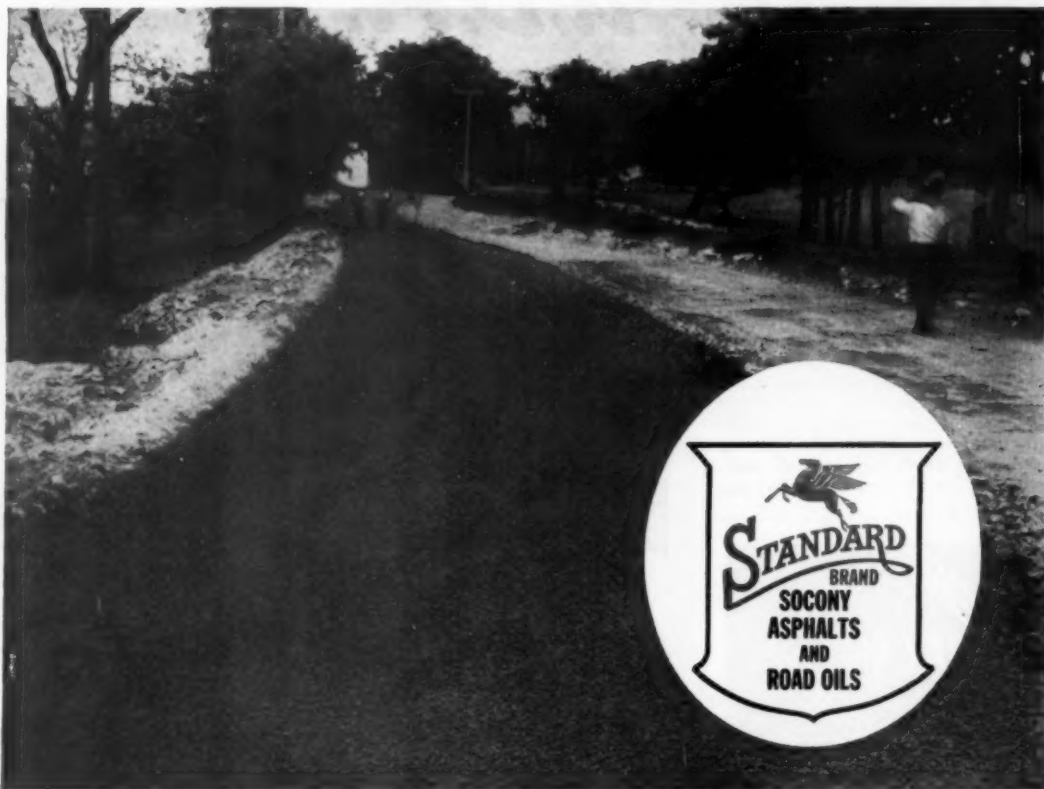
WINDBREAKS

CONTRACTORS SUPPLY DEALERS in every state will use Fulton line. Specify SHURE-DRY and FULTON Tents, Tarpaulins, and Windbreaks—anything made of canvas. Also Fulton Road Mats and Burlap. Fulton products are used and their prices are right.

If your dealer can't supply you write our nearest plant for name, samples and price list.

Fulton Bag & Cotton Mills
Manufactured Since 1820
ATLANTA ST. LOUIS DALLAS
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ANOTHER GOOD ROAD MADE BY GOOD ENGINEERING AND GOOD PRODUCTS



Socony Asphalt Binder, Bituminous Penetration Macadam, Standard Brand—Montague, Mass.

SOCONY Asphalt Road Oils • Socony Asphalt Joint Fillers • Socony Waterproofing Asphalt • Socony Cut-Back Surfacing Asphalt • Socony Asphalt Binder A for surface treatment • Socony Refined Asphalt for sheet asphalt paving • Socony Cold Patch Asphalt for all types of patching • Socony Asphalt Binders B & C for penetration work (Asphalt Macadam) • Socony Paving Asphalt 51-60 and 61-70 Penetration for the mixing method (Asphaltic Concrete) • Socony Asphalt Emulsions • Specifications and all other particulars furnished on request.

SOCONY-VACUUM OIL CO.
INCORPORATED
STANDARD OIL OF NEW YORK DIVISION

THE STRONGEST GEARED POWER FOR ITS WEIGHT IN THE WORLD

ALL STEEL HAND HOIST

SEATTLE, U.S.A.

CONTACT—POWERFUL—SAFE

"For use where power is not practical or available"

Manufactured in 3, 5 and 15-Ton Sizes. For capacity comparison, 1/2" cable used:

2-Ton "Lightweight"	75 ft.
5-Ton "General Utility"	250 ft.
15-Ton Triple-Geared "Special"	1200 ft.

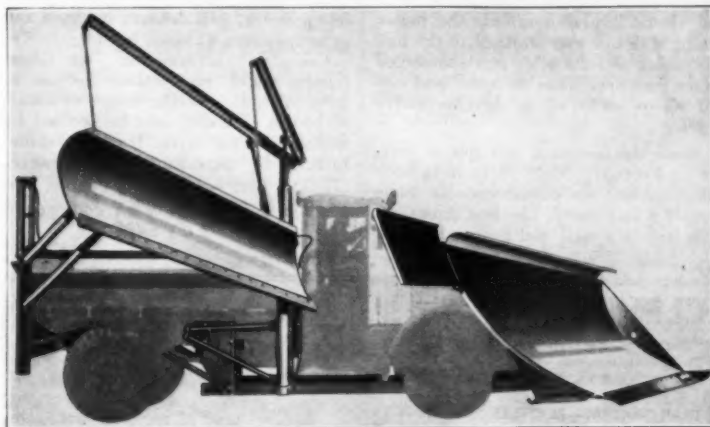
Patent instant gear change and positive internal brake that never fails, and will lock load.

Gear Ratio	Weight	Price
2-Ton 4 & 22 to 1	60 lb.	\$50
5-Ton 4 & 24 to 1	110 lb.	\$75
15-Ton 4, 19 & 109 to 1	650 lb.	\$200

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2724 4th Ave., So., SEATTLE, WASH.

Warehouse stocks for dealers' supply: Seattle—Chicago—Brooklyn—Houston. Complete literature and list of dealers in Principal U. S. Cities and Foreign Countries Gladly Mailed.



One of the New Bros SnoFlyers

Recent Developments In Line of Snow Plows

Additions to the line of SnoFlyer snow plows, made by the Road Machinery Division, Wm. Bros Boiler & Mfg. Co., Minneapolis, Minn., now provide a complete line of V-plows suited to all sizes of trucks, wheel tractors and even passenger automobiles. All of the plows are of the same shape and proportion, and all have the characteristic mold-board shape with no forward roll, except for the top spring flare boards which keep the loose snow from flying onto the windshield. This feature is claimed to make possible higher speeds by providing full vision ahead.

These plows are much wider at the top than at the bottom, in order to slope the banks, and the stub wings form shelves in deep snow to prevent any snow from falling under the wheels of the truck. The wings may be folded back out of the way, if desired, or readily removed.

The plow form is held in shape by a series of bulkheads which are electrically welded to the moldboard and to each other, making the entire plow one electrically welded unit. The plows are carried on three adjustable self-aligning shoes with replaceable runners in the three larger sizes, and in the two smaller sizes two bolted adjustable runners carry the load. When not plowing, all models are carried by hydraulic rams operated from the cab of the truck. The plows are attached to the trucks in such a manner that the plow thrust is taken on the front end of the truck's frame di-

rectly against the plow bulkhead. On all except the smallest model, beams running back under the axle hold the plow steady and take part of the thrust.

The SnoFlyer side widening wing is

obtainable for any size truck from 1½-ton up. It is usually provided with power operation and can be furnished for four-wheel-drive trucks when desired, with attachment forward of the truck cab. One-way moldboard plows interchangeable with the V plows are also made by this company.

Complete information on this line of SnoFlyer snow plows may be secured by interested state and county highway maintenance engineers direct from the manufacturer.

New Pipe Welding Booklet

Arc welding of pipe for pressures up to 1,500 pounds per square inch and temperatures up to 1,000 F. is described in a new 12-page booklet issued by the Metal & Thermit Corp., 120 Broadway, New York City. In addition to the selection of pipe materials and welding electrodes, this bulletin discusses weld design, procedure, preheating, stress relieving, testing of welds and the qualification of processes and operators.



NEW 6" PUMP

Heavy-duty design. Ideal for wellpoint service, bridge pier holes, etc., when large capacity is required.

Compact design. Oil seal eliminating packing. Tremendous capacity — 90,000 gph. Automatic priming, without handles requiring adjustment. Easy accessibility.

Ask for Bulletin CEM-38

MARLOW PUMPS

Ridgewood

New Jersey



White's the Buy! FOR DUMP TRUCK PERFORMANCE AND ECONOMY

ASK THE OPERATORS who have switched to White Dump Trucks during the past year. They'll tell you their cost records prove that the new Whites are the stand-out buy of the field for performance and economy.

Primarily responsible are the two newly developed White engines . . . of 362 and 318 cu. in. displacement respectively . . . which incorporate more new and exclusive performance and economy features than any other truck engines on the market.

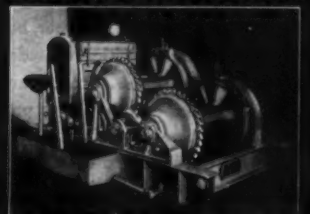
Make the "Direct Comparison Test" on your own operation soon. Find out what the new Whites have that make experienced operators from coast-to-coast say: "White's the buy in the dump truck field this year!"

Pictured here is one of a fleet of 10 new White Model 750's in the service of the Riverdale Contracting Corp., New York City, helping to build the new North Beach Airport, on Long Island, near the site of the 1939 New York World Fair. When completed the airport will be one of the largest and most modern in the world. The Whites operate on 8-hour shifts, the engines running continuously 8 hours at a time. Remarkable fuel economy records have been made.

THE WHITE MOTOR COMPANY • Cleveland
Branches and Dealers in all Principal Cities

White TRUCKS

BUYING A HOIST?



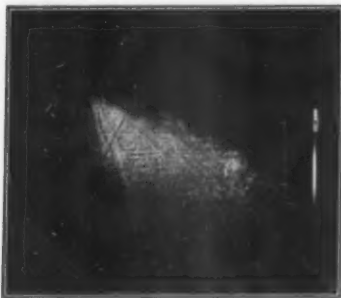
JAEGER Ball Bearing HOISTS up to 100 H.P. Offer . . .

- Finger-Tip Hoist Control (same as on \$12,000 Shovels)
- Finest Double-Row, Self-Aligning Bearings,
- Machined, Balanced Drums
- Silent Chain Drive, Compounding Brakes, etc. 1, 2 or 3 drums (interchangeable), Gas or Electric.

Get our low prices on light 10-20 H. P. and intermediate 25 H. P. Screw Thrust Hoists. Send for Catalog H-37.

THE JAEGER MACHINE CO.
701 Dublin Ave. Columbus, Ohio

JAEGER



An Installation of a New Type of Reflector on a Highway Between Detroit and Lansing, Mich.

Reflectors Mark Road From Auto Headlights

A new type of reflector mounted on posts along the roadside has recently been installed on U. S. 16 between Detroit and Lansing, Mich. These reflectors, installed on either side of the highway, pick up the light from automobile headlights and outline the course of the road, showing up curves and the alignment of the road for as far as a mile ahead of the driver, according to the manufacturer.

These powerful new reflectors are made of Lucite methyl methacrylate, a plastic recently developed by E. I. du Pont de Nemours & Co., of Wilmington, Delaware. It is water-clear, flexible and non-shattering. This plastic moulds much more accurately than glass and retains permanent transparency.

Placed along the highway 100 feet apart on either side, except at curves where they are set slightly closer, these reflectors outline the highway sufficiently for safe night driving. These markers are based on the optical principle known as retro-directive reflection. Of the two practical types of retro-directive reflectors, the one used here is the triple reflector or cube corner. No silver or metallic reflecting surfaces are used because the cube corners themselves, although transparent, are none the less practically perfect prismatic reflectors.

These highway reflector units, which have also been installed along highways in New York, New Jersey and several other states, are assembled for distribution by the Signal Service Corp., Elizabeth, N. J.

Submersible Pump On New Principle

The design of the new submersible deep-well turbine pump recently announced by the Byron Jackson Co., 2150 E. Slauson Ave., Los Angeles, Calif., is claimed by the manufacturer to be a radical departure from the conventional type of deep-well turbine pumps.

On the new Byron Jackson pump the motor is below, instead of above, the turbine bowls. The propelling shaft is very short and the unusually long,

small-diameter motor operates submerged at all times. However, the liquid pumped does not come in contact with the electrical parts or motor bearings, as these are enclosed in an oil-filled case with a mercury seal where the shaft passes through at the top. The turbine and the submersible motor form a compact unit which is attached to and supported by the discharge pipe. A submarine armored cable and a small copper oil tube form the only connection, aside from the discharge pipe, between the pumping unit and the surface of the ground.

The motor is a squirrel cage induction type and its rotor is carried on two ball bearings, one of which is a radial thrust to take both the small weight of the rotary parts and the hydraulic load. The other ball bearing is of the radial type and its chief function is to center the load. A high dielectric oil is circulated through the entire windings at all times. Water is sealed out at the top by mercury in a rotating cup attached to the motor shaft. A cylindri-

cal sleeve is placed around the motor shaft, with one end attached to the motor casing and the other end submerged in the mercury. Thus the water and motor oil are sealed off on their respective sides.

Since the first unit was put in service in February, 1929, there have been some 12,000 hp of submersible units installed and tested. The first pump, set 450 feet in a well and powered with a

50-hp motor, still delivers its rated 250 gpm against a 475-foot head.

Complete information on these pumps, which are suitable for use in deep or shallow wells, sumps or natural bodies of water, may be secured by those interested direct from the manufacturer by mentioning this magazine.

Want any information on equipment? Write the Editor.

CLEVELAND

Paving Equipment

MANUFACTURERS OF
FORMGRADERS
SUBGRADE SCRAPERS
TRAILGRADERS—ROOTERS
SUBGRADE SCRATCH
PUSH PLANERS
TEMPLATES
CONCRETE STRIKEOFFS

Aluminum & Steel Straight-edges, Hand Tools, All-Steel Floats, Float Bridges, etc.

THE CLEVELAND FORMGRADER COMPANY 8725 Denison Ave., Cleveland, O.



HEAVY-DUTY TRAILHEADER



CHECK these advantages of *Franklin AIRCOOLED* INDUSTRIAL POWER UNITS

against your present power costs. They give you some reasons for the construction industry's rapidly growing appreciation of the inherent economy of air cooled engines for industrial use.

LOW OPERATING COST

Greater positive fuel economy is assured because of the air cooled engine's highly efficient cooling system which enables it to quickly develop more efficient and constant operating temperatures. Accurate field records show gasoline savings up to 30% over water-cooled types of power.

other plumbing fixtures is entirely eliminated. An air cooled engine is easily serviced by any good mechanic familiar with ordinary water cooled engine practice. Its extremely simple construction and easy-access design makes for economical maintenance. For example, its individual cylinder construction alone effects radical savings in time, labor and expense.

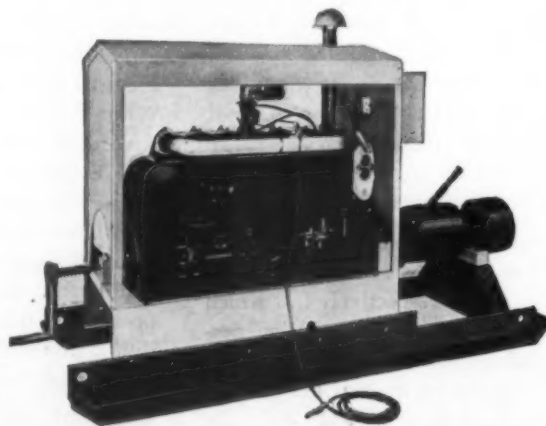
LOW MAINTENANCE COST

In an air cooled engine, the expense of maintaining radiator, water pump, hose, fan belt and

● An air cooled engine is an all-weather engine because it will not freeze in zero weather, boil or overheat in extreme heat or high altitudes, —and requires no anti-freeze. Frozen and cracked engine blocks are a thing of the past, —constant draining and refilling is no longer required,—nor is it necessary to locate your unit close to a water supply.

● An air cooled engine weighs less because it has no radiator, plumbing system or water. The use of aluminum alloy in cylinder heads and other mechanical parts adds to its lighter weight without any sacrifice of ruggedness. In trucks, especially, this saving in weight is important because it allows for greater payload.

If your problem is one of power for road machinery, trucks, industrial equipment, agricultural machinery, saw mills, compressors, pumps or other industrial use,—write for Bulletin No. 9E and learn how you can cut your power costs.



AIR COOLED MOTORS CORPORATION

Executive Office • 115 MADISON AVENUE
NEW YORK, N. Y.

• SYRACUSE, N. Y.

USE RIGHT BUCKET FOR THE JOB



Hayward makes all four — clam shell, drag-line, electric motor, orange peel. A Hayward recommendation is unprejudiced.



THE HAYWARD CO., 32-34 Day St., New York

HAYWARD BUCKETS

An Index to the Right Vibrator for Your Job

An interesting new booklet designed to acquaint contractors and engineers with the variety of sizes and styles of Jackson concrete vibrators, grinders, drills, portable power plants and accessory equipment has recently been issued by the Electric Tamper & Equipment Co., Ludington, Mich. This handy-sized booklet indicates as well as describes and illustrates the proper type and size of vibrator for mass concrete, general construction, light construction, form vibrating, concrete slabs, concrete pipe and miscellaneous uses.

It also contains descriptions and illustrations of Jackson grinders and surfacers, backfill tampers, sump pumps, power plants and accessories. Copies of this booklet may be secured by interested readers direct from the manufacturer.

New Wire Rope Plant Of Jones & Laughlin

The completion of a modern wire rope plant at Muncy, Lycoming County, Pa., as an additional unit of its expansion and development program has been announced by the Jones & Laughlin Steel Corp., Pittsburgh, Pa. The new plant, to be known as the Gilmore Wire

Rope Division of the Jones & Laughlin Steel Corp., began operation in July. It marks the entry of this corporation into a new line of finished wire rope for general construction purposes, industrial application and oil field use.

The fabrication and sale of the products of the new plant are under the direction and supervision of Robert Gilmore, General Manager, with offices at Muncy, Pa.

New B-E Dealer in Ohio

The Bode-Finn Equipment Co., Inc., 1654 Central Ave., Cincinnati, Ohio, has been appointed distributor in southern

Ohio by the Bucyrus-Erie Co., South Milwaukee, Wis., for its line of shovels, draglines, and cranes. This new dealer will work in cooperation with the Bucyrus-Erie branch office at 1502-03 Clark Bldg., Pittsburgh, Pa.

Dow Elected Milburn V. P.

Walter K. Dow, Plant Superintendent for the Alexander Milburn Co., of Baltimore, Md., has been elected Vice President of the company. Mr. Dow has contributed particularly to the development and production of the Milburn line of paint spray equipment, welding and cutting apparatus and portable lights.

WHAT'S NEXT ON THE PROGRAM?

WHEN you've got a "Caterpillar" Diesel Tractor, you've got *more* than a one-job machine! This is a tool that can keep *profitably* busy—the whole day long—handling many different phases of road-construction or maintenance. And as it goes from task to task, you're sure of your power, traction and fuel-economy!

These 3 pictures all show the *same* "Caterpillar" Diesel D6 Tractor owned by Yavapai County, Arizona. A typical day's work-program might be something like *this*:

With its LeTourneau bulldozer, you'll see it roughing out a new road around ten o'clock in the morning. Along towards two in the afternoon, it transfers its power from front to rear . . . and goes to work with a ripper (followed by a county-owned "Caterpillar" Diesel D7 pulling a scraper). Then a little later—say about three o'clock—it hooks on to a No. 66 power-controlled "Caterpillar" Grader and works until time to knock-off!

Quick changes from ripper to grader—or any other tool—are readily accomplished simply by pulling the drawbar-pin. But more important to you, than that, is the fact your "Caterpillar" Diesel is *paying its own way*: Piling up savings on fuel . . . giving you hours of steady operation with infrequent maintenance . . . *wiping out its purchase-price* by a long life of many different and useful services!

10 A. M.

2 P. M.

3 P. M.

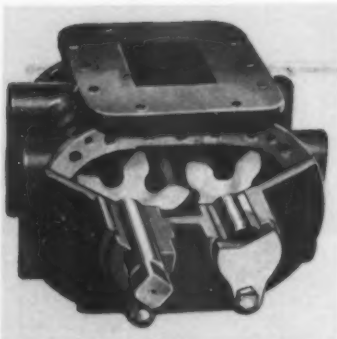
CATERPILLAR TRACTOR CO.
PEORIA, ILL.
DIESEL ENGINES • TRACK-TYPE TRACTORS • ROAD MACHINERY

ETNYRE'S

40TH Anniversary

1898-1938

ETNYRE "Blacktopper" DISTRIBUTORS ACHIEVE HIGHEST SALES IN ROAD-BUILDING HISTORY



Etnyre Rotary Pump



Etnyre-Le Roi Motor

ETNYRE BLACKTOPPERS

are built of finest quality materials furnished by the world's leading suppliers. Typical of the companies who supply raw materials or parts for Etnyre Blacktoppers are the following:

A. M. Castle & Co.,
Chicago, Ill.
Le Roi Company,
Milwaukee, Wis.
Edgar T. Ward's Sons Co.,
Chicago, Ill.
W. D. Allen Mfg. Co.,
Chicago, Ill.
Columbia Pipe & Supply Co.,
Chicago, Ill.
National Sewing Machine Co.,
Belvidere, Ill.
H. Channon Company,
Chicago, Ill.
Barco Manufacturing Co.,
Chicago, Ill.
Moline Malleable Iron Co.,
St. Charles, Ill.
Rockford Screw Products Co.,
Rockford, Ill.
Blood-Brothers Machine Co.,
Allegan, Mich.
Heim's Machinists' Supply,
Rockford, Ill.
Geo. D. Roper Corporation,
Rockford, Ill.
Gunite Foundries Corp.,
Rockford, Ill.



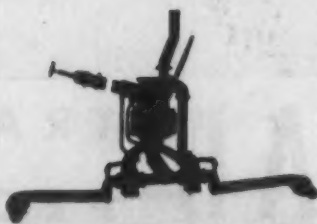
For Better Bituminous Roads . . . at lower costs, send for complete information on Etnyre Blacktopper now!

AS OUR company reaches its fortieth year in building road and street machinery, we are pleased to advise that the sale of Etnyre "Blacktoppers" has achieved leadership position in bituminous distributors. We are grateful to the road contractors and highway officials who have so loyally preferred the superior quality of Etnyre construction. It has been our constant policy to build bituminous-material distributors to the highest standard, knowing that the real cost or value of a distributor is not determined by the purchase price, but rather by the years of dependable service it renders. The "Blacktopper" is the fulfillment of forty years of manufacturing experience, devoted wholly to road and street machinery. Consequently, Etnyre "Blacktoppers" have found their way to all parts of the world . . . wherever good blacktop roads are being built and maintained. Etnyre "Blacktoppers" have stood the test of time, in gruelling service, applying the heaviest or lightest of asphalt, tar, road oil or emulsion with accuracy and economy . . . for road contractors and highway officials throughout U.S.A. and in many foreign countries. There is no substitute for Etnyre "Blacktopper" quality . . . nor an equal of its dependable, economical performance.

12 Full-Length Flues



Double Burner Flue System



"Veen-Flo" Circulating System

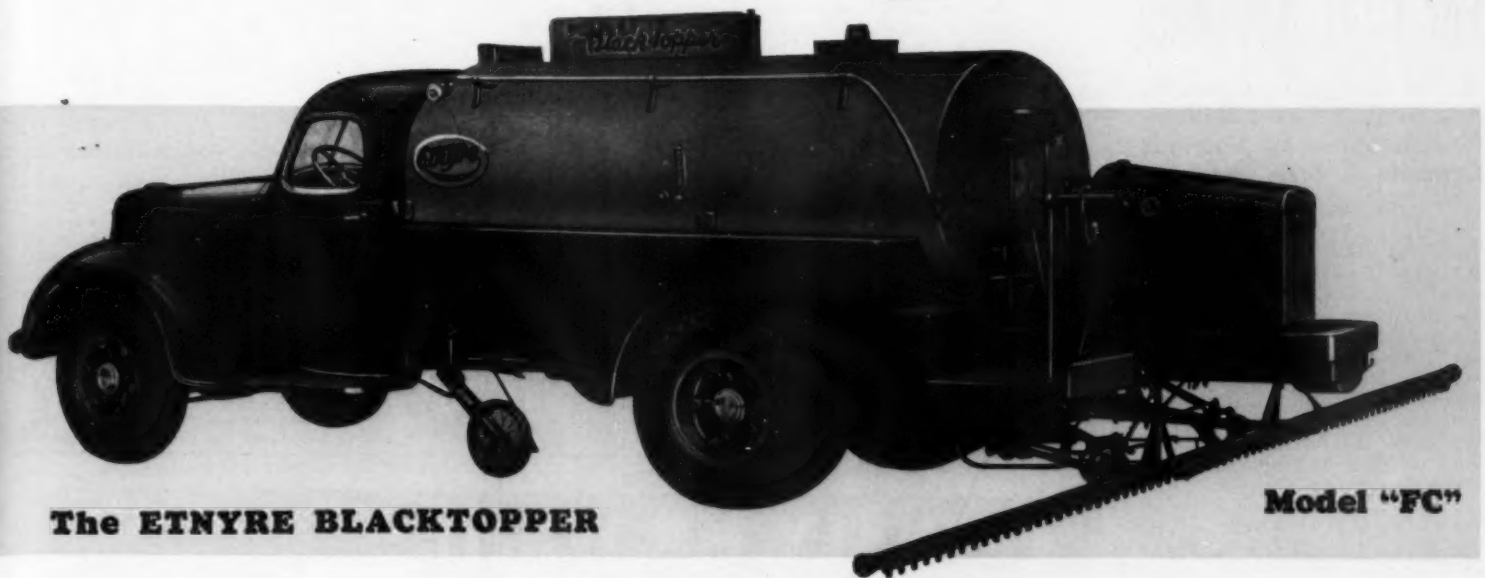
Etnyre Triple-Lap Spray



Gives Even Accurate Coverage



Spraying with Part of Bar

**The ETNYRE BLACKTOPPER****Model "FC"****Full-Width Distribution****Twenty-four Feet or Wider****No Drips! No Skips!****No Leaks! No Streaks!****FULL-LENGTH CIRCULATION****OF FLUID FROM TIP TO TIP**

Etnyre has pioneered many advancements in bituminous-material distributors. Probably the majority of all major improvements can be traced to Etnyre origin and engineering. Full width distribution, up to 24 feet, in one forward trip . . . and non-drip spray bars are typical examples. Today, Etnyre Blacktoppers, in modern streamline design are made in tank-capacity sizes 600 to 2000 gallons; for mounting on any make of truck or semi-trailer. The new full-length circulating bar, shown above, applies from 1/10th to 3 gallons per square yard of heaviest or lightest materials, without drips, skips, leaks or streaks! The Blacktopper fills its own tank from tank car or storage tank. Pumps material directly from tank car to storage tank. 12 full-length flues, with double burners give fast heat, safely. The powerful Etnyre rotary pump is driven by a specially-designed Le Roi Motor. And . . . an Etnyre is simple and easy to operate . . . ask any experienced operator. All controls within quick, easy reach. Special front-end controls for one-man operation may be had, if desired. Special Etnyre 5th-Wheel tachometer or bitumeter accurately controls amount of application. Maximum daily output, with no delays has earned the enviable position the Etnyre Blacktopper enjoys with experienced contractors and highway officials all over the world. Investigate the new "Blacktopper" . . . now.

(Continued from opposite column)
Joseph T. Ryerson & Son, Inc.,
Chicago, Ill.

Zimmerman Steel Company,
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Hauck Manufacturing Co.,
Brooklyn, N.Y.

American Coil Spring Company,
Muskegon, Mich.

Barber-Colman Company,
Rockford, Ill.

United States Gauge Co.,
New York, N.Y.

Pennsylvania Flexible Metallic
Tubing Co.,
Philadelphia, Pennsylvania

The American Brass Company,
Waterbury, Conn.

Mid-States Industrial Corporation,
Rockford, Ill.

The Garlock Packing Company,
Chicago, Ill.

Illinois Philip Carey Company,
Chicago, Ill.

Etnyre Blacktoppers are built by skilled workmen, who have specialized in distributor-building for many years. Naturally, Etnyre Blacktoppers are fully guaranteed . . . and are famously known as "America's Finest Distributors."

**Spray Bar in Traveling Position****18-ft. Distribution****24-ft. Bar in Operation**

E.D. ETNYRE & CO.

Factory and Main Office, OREGON, ILLINOIS

Huge Precast Pipe For Calif. Aqueduct

World's Largest Concrete Pipe Required New Methods Of Fabrication by American Concrete & Steel Pipe Co.

By RALPH BAKER

(Photos on page 36)

† SIXTY miles east of Los Angeles the main line of the Colorado River Aqueduct terminates at Cajalco Reservoir, and from there the main distribution line runs to Pasadena, some 50 miles to the west. For certain sections of this distribution line the largest precast concrete pipe that has ever been made has been used, the fabrication and handling of which have necessitated new methods and designs.

The huge pipe was cast in sections 11 feet 8 inches to 12 feet 8 inches in diameter and 13 inches thick, with $2\frac{1}{2}$ tons of reinforcing steel and $20\frac{1}{2}$ cubic yards of concrete, the whole weighing 42 tons. Before determining the specifications of the pipe, extensive tests were made by the Metropolitan Water District of Southern California to arrive at the most economical arrangement of steel reinforcing and to study other problems incident to handling and construction, and an experimental section was built on the main aqueduct.

The findings were incorporated in the processes of the contractors to whom the bids were subsequently let, the American Concrete & Steel Pipe Co., of Los Angeles, the United Concrete Pipe Corp., and the J. F. Shea Co., Inc., and in the main the results are similar. Variations of the process, however, were worked out by each contractor.

Large plants were set up by each of the contractors especially for the fabrication of the big pipe, but since the American Concrete & Steel Pipe Co. was the first to begin, it is its set-up that will be described here.

The plant, costing in the neighborhood of \$250,000, was located near the job just east of Ontario, California, and consisted of a concrete mixing plant, a casting line, cage winding and welding equipment, and curing yard. The maximum production capacity was 16 sections per day. Practically all of the equipment for the manufacture and installation of the pipe was designed by the company and some of it has been patented.

Cage Winding

The steel reinforcements consist of two steel cages of round rods wound spirally and welded together. The outer layer is elliptical in shape and contains two-thirds of the steel. The inner layer is circular and contains the other one-third. The rods are $\frac{1}{2}$ to $\frac{3}{4}$ inch in diameter, and were furnished by the Columbia Steel Co., of Torrance, Calif., in 200 to 250-foot lengths. The Soule Steel Co., rewound these coils and welded them in lengths of 1,600 to 2,000 feet, sufficient to wind one of the two spirals

for each section.

Cages were wound on a machine, designed and built by the contractor, that gives any desired spacing to the coils which form a continuous spiral. It consists of a carriage mechanism which straightens the rod and bends it to the proper curve, and a winding drum. The inner circular spiral is wound first. The rod is fed through an electrically operated guide car which moves along the side of the winding drum and regulates by its speed the spacing of the spirals. The mandrel over which the steel is wound is made of a steel cylinder cantilevered over a concrete support to balance the lift. It is operated by a 15-hp electric motor which turns it at a rate of about 4 rpm.

Tubular spacers were placed outside the cage so formed and the outer cage was wound over these spacers. The completed spirals were welded to four longitudinal spacer bars for temporary rigidity, and the other spacers were removed. The cage was removed from the drum by collapsing seven segments of the man-

drel which were held in place by sections of inflated fire hose. Heavy canvas slings on a gantry crane were used to remove the cage from the drum and deposit it on three belts which spanned a shallow pit. Here 18 more spacer bars were spot-welded to the spirals with portable Lincoln electric weld-

ing machines. The whole process of winding and welding took about one hour per cage.

The total area of steel per square foot of pipe varies from 1.8 to 2.8 square inches. A separate cage made up of three $\frac{7}{8}$ -inch round steel bars welded

(Continued on page 24)

... the Lansing 3½-T Mixer



NOW—with Pneumatic Rubber Tires

Faster trailing—quicker on the job, more production—better profits. Hyatt roller bearing wheels; large, fast mixing drum; Alemite fittings; Lauson 2 H.P. gasoline engine—and other Lansing features make the 3½-T your best mixer investment. WRITE for complete specifications and prices.

LANSING COMPANY

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Chicago New York Philadelphia Kansas City
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FRANKLY, MR. WHITE -

I rely on the advice I get from Blaw-Knox



BLAW-KNOX Construction Equipment

Includes—

Road Forms
Batcherplants
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Weighing Batchers
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Tamping Rollers
Steel Forms
Open Steel Bridge Decking
Steel Grating
Steel Castings
Lubrication Systems
Pressure Piping Systems

It has long been the practice of Blaw-Knox to extend the helping hand of experience to construction men—a service far beyond the mere selling of equipment.

Blaw-Knox expresses its interest in your job with real, fundamental reasons for applying proper equipment to the work—to the end that job progress will be better, costs lower, and that profits will be definitely assured.

What helps your business, naturally helps Blaw-Knox. Blaw-Knox Construction Equipment has been sold on that basis for more than thirty years.

BLAW-KNOX DIVISION OF BLAW-KNOX COMPANY

FARMERS BANK BUILDING

PITTSBURGH, PA.

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BLAW-KNOX

HOBART WELDING MAKES MONEY FOR YOU... SAVES IT FOR YOUR CUSTOMERS

Hobart "Simplex" Portable, Gasoline Engine Drive Welder lets you make repairs right on the job—saves loss of time, expensive shut-downs and repair parts bills. Ample power for the heaviest construction work. Will easily pay its own way.



BUILD YOUR OWN portable welder by using special extension supplied to your engine. Save \$500 to \$1,000. Ask for details, no obligation.

30 DAYS TRIAL At Our Risk... Ask for Details write for FREE Book

HOBART BROTHERS CO., Box C-E-M, Troy, Ohio

All-Wheel-Drive Trucks For Year-Round Road Work

Marmon-Herrington all-wheel-drive units, from the smallest converted Ford pick-up trucks to mammoth six-wheel trucks with all wheels driving, are used extensively by highway departments in all of the northern and northwestern states of the United States and in many foreign countries for road building and road maintenance the year round. The advantage of the all-wheel-drive in snow removal is that of positive traction so important for accomplishment and eco-

nomical operation.

Complete information on the all-wheel-drive may be secured by interested state and county highway engineers and contractors direct from the Marmon-Herrington Co., Inc., Indianapolis, Ind., by mentioning this magazine.

Booklet on Industrial Friction Materials Issued

In a new illustrated brochure "Industrial Friction Materials," Johns-Manville has gathered together comprehensive data on its complete lines of industrial

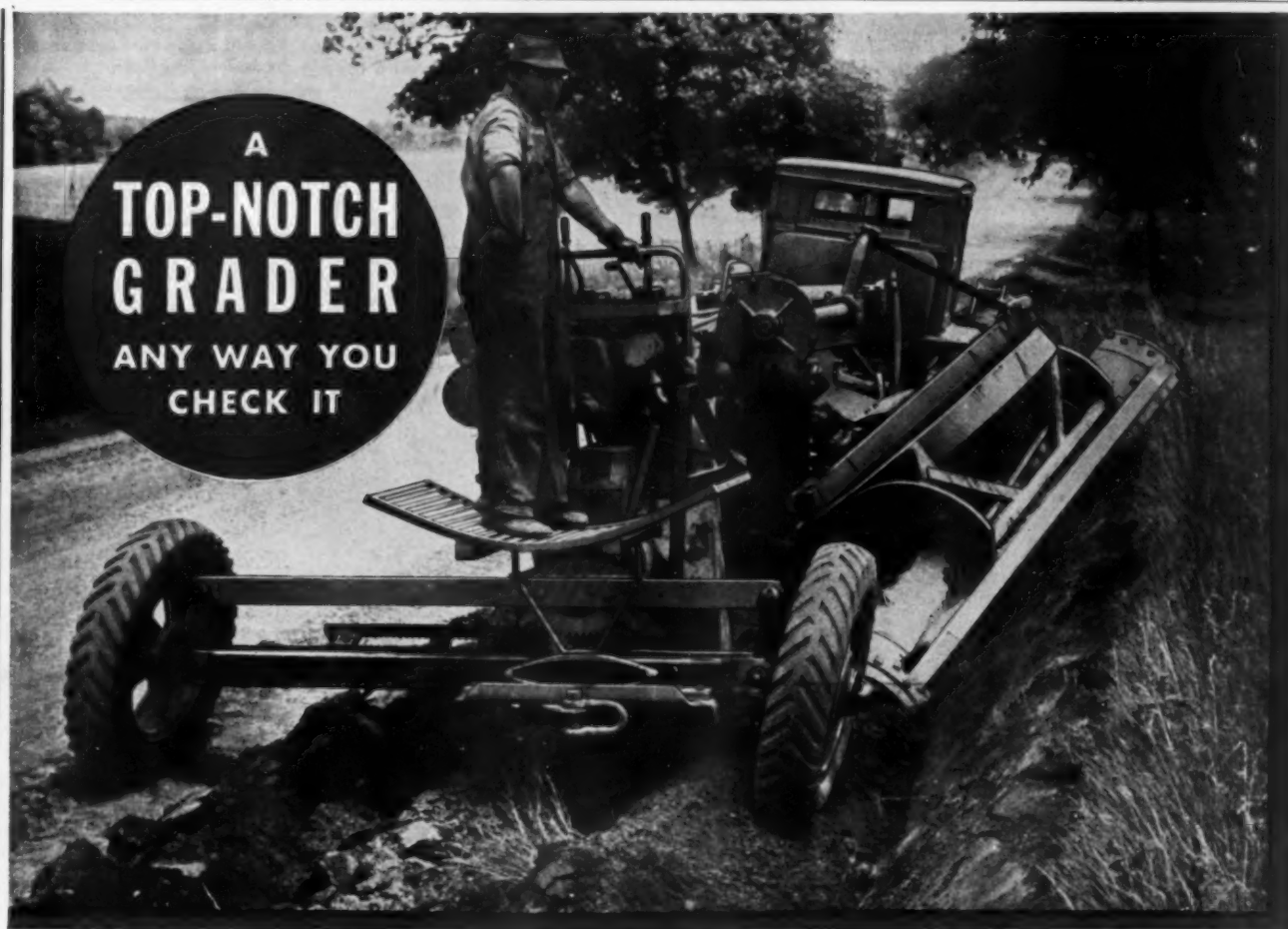
brake linings and blocks and clutch facings for all types of industrial equipment. One of the features of this booklet is a chart which simplifies the selection of the most suitable friction material for any specified service. Supplementing this chart is a second table giving the coefficient of friction, size limits, thickness, tolerances and recommended service conditions for each of the various types of J-M industrial brake linings and blocks and clutch facings.

Copies of this brochure, Form FM-7A, are available upon request to Johns-Manville, 22 E. 40th St., New York City.

N. H. Convention Adopts Anti-Diversion Proposal

The convention to revise the constitution of New Hampshire adopted a resolution, by a vote of 242 to 180, proposing an amendment to the Constitution that will prevent the diversion of motor vehicle registration fees, gasoline taxes and other special motor vehicle revenues, to other than highway purposes.

Proposals adopted by the Convention will be submitted to the voters for approval or rejection in the autumn.



THE quick adaptability of Adams Leaning Wheel Graders to every job, their easy operation, their capacity for hard work, and the vast amount of time which they save on all types of work is common talk among owners and operators everywhere. Hundreds of users marvel at the strength of Adams narrow, box-type frame—adequate for every need . . . Most of these owners investigated and are entirely familiar with every other well-known make of grader on the market and they will tell you without hesita-

tion that Adams graders have no equal.

In their fourth year of "making good" under every conceivable condition, these graders in 12, 10, and 8 ft. sizes are scattered all over the map. Before buying your next grader, let your local Adams representative show you one or more in action, or write for catalog, addressing J. D. Adams Co., Indianapolis, Indiana.

NOTE: The Adams line includes smaller leaning wheel graders also, and a complete line of motor graders, elevating graders, hauling scrapers, etc. Catalogs on request.



ADAMS

Leaning Wheel

GRADERS

✓ STRENGTH

✓ RIGIDITY

✓ VISIBILITY

✓ WIDE RANGE
OF WORKING
POSITIONS

✓ QUICK
ADJUSTMENTS

✓ EASY OPERATION

✓ DURABILITY

✓ LOW UPKEEP COST

Special Equipment On Ore. Grading Job

(Continued from page 2)

cession. The object was to lay the smaller logs apart, but in the case of the larger ones merely to split and partially open them. Fires were then lighted in the split logs where they lay on the hillside or in the bottom of the canyon. Frequently as high as an 80 per cent burn was obtained in this way before the logs were touched. The next step was to go in with a bulldozer and push the pieces together, or else drag them down from the slope with a cable from a jinny rigged on the rear of the bulldozer. Eventually, the burn was completed down near the bottom.

Portable Fire-Fighting Equipment

The law requires certain fire-fighting equipment on such construction jobs, even if the contractor himself did not aim to keep down fire hazards to a minimum, which he usually does. Where there is so much burning going on, it is necessary to put out immediately all spot fires which might get started outside the range of the burning operations. DuMont and McCracken rigged up a special type of fire-fighting unit which was not only portable but highly effective. They assembled a Briggs & Stratton gasoline motor and a high-pressure gear pump on a carrying frame fabricated out of 1½-inch pipe and welded. The weight of the whole assembly was approximately 150 pounds and two men could pick it up and run off with it at considerable speed. The pump developed a pressure of 75 pounds per square inch. There was also from 1,500 to 2,000 feet of fire hose always available on the job, in 50-foot lengths with couplings. If a spot fire started, the pump was hurried to the location, and the nearest men rushed hose sections to the spot and coupled up a length sufficient to reach the creek.

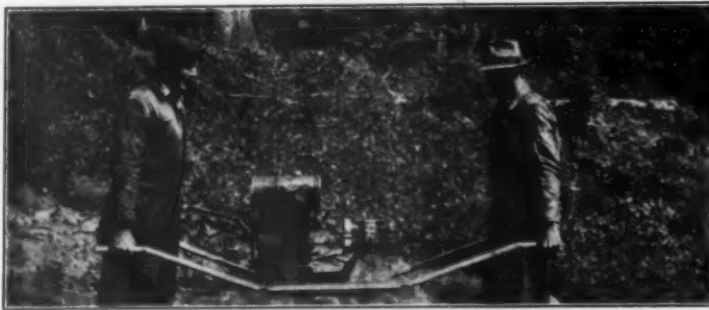
Portable Lighting Equipment

The ordinary small commercial lighting plant did not have sufficient capacity in a weight making transportation easy. For the purpose of driving the 7,000-pound high-pressure grease gun on the service truck, and at the same time to furnish light for night work in greasing trucks and other heavy equipment, a special plant was designed for mounting on the truck. This consisted of a 4-hp Briggs & Stratton gasoline engine driving a 6-hp Wrappier Mfg. Co. electric generator, the two being mounted as a unit on a frame fabricated out of channel iron and welded.

Handling Fuel

There was yet another feature in connection with the servicing of the heavy equipment. Near the southern entrance of the Houck section, a 6,000-gallon tank had been located in a small building. This tank was about evenly divided to hold gasoline in one end and diesel fuel in the other. These fuels were pumped in from the tankers that drew up alongside, by means of a compact pumping unit, consisting of a rotary pump driven by a Briggs & Stratton 4-hp gasoline engine.

Arrangement was also made to pump the fuels out of the storage tank into 1,000-gallon tanks mounted on sleds which could be dragged out on the job by tractors. Right in front of the pumping unit just mentioned there was mounted a Western Electric 115-volt d-c generator, belt driven from the pumping unit shaft. This small generator furnished the current for two motors mounted on top of the fuel tank. These motors operated two small pumps, one for the diesel and one for



The Portable Fire-Fighting Unit

the gasoline end, which pumped these fuels into the sled tanks.

There is no electric power line in the

vicinity of this job, and it was therefore necessary to rig up these individual electric plants, or else build a tempo-

rary central power plant of considerable size to take care of all the various services. Considering the duration of the work and the length of power line that would be necessary from any kind of a central plant, the contractor chose to manufacture his electric power at various points with portable or semi-portable equipment as described.

Personnel

This section is one of three immediately south of the Arch Cape Tunnel which will complete the Oregon Coast Highway as a hard surfaced road from border to border of the state. It is a project of the Oregon State Highway Commission, of which R. H. Baldock is State Highway Engineer. J. H. Scott was Resident Engineer.

**HIGHBALL YOUR WAY TO More PROFIT WITH
FASTER POWER**



COMPARE YOUR OUTPUT AND COSTS WITH FASTER POWER PERFORMANCE

For output check:
Starting Time
Working Speeds
Flexibility
Ease of Handling
Time Losses for Repairs

For cost check:
Initial Cost
Upkeep Cost
Cost of Fuel per Gallon
Cost of Lubricating Oil
Working Life
Trade-In Value

These factors determine your cost per yard. With A-C equipment operating costs will be low, operating speeds high.

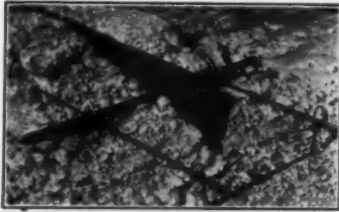
ODD JOBS DONE QUICKLY—This K-O tractor and Baker bulldozer owned by Bailey & Bergonia, makes short work of filling in around a culvert on the "Lakes to Sea" highway near Phillipsburg, Pa. Ease of handling and quick pick-up makes the K-O an ideal bulldozing tractor. Put it to work keeping extra jobs abreast of the main work.

SHIFT ON THE GO—The Model S-O tractor shifts on the go like a truck—the time usually lost changing gears goes into profitable extra trips. Here Albert Bros. use an S-O and 7-yd. Continental to end dump over the edge of a fill on the Skyline Drive near Charlottesville, Va. Continental scrapers will speed your job by fast loading, by back-filling on slopes, against bridge abutments and over culverts where most scrapers cannot place dirt.

Keep your hauling roads smooth and fills level with a Speed Patrol, thus give hauling equipment a chance to move bigger loads faster and with fewer time-robbing gear changes. Then use outfits that can get up and travel—faster-moving Allis-Chalmers rigs. You get going more quickly because A-C engines start instantly and go right to work. As a result you gain from 1 to 3 payloads per shift with your tractor-scraper outfits on starting time alone. You travel faster and move more payloads every hour because A-C tractors have more and higher speeds—up to 6.41 m.p.h. or 100 feet in .177 minutes with Model L or L-O. Short turning, easy handling and quick pick-up save you trip-gaining seconds getting into and out of cuts, swinging about on narrow fills, maneuvering in tight spots. Pictures here show how others use A-C's FASTER POWER to keep their jobs rolling at a fast, profitable pace. You can do likewise.

Ask your Allis-Chalmers dealer how you can highball your way to lower costs with FASTER POWER.





The Union Road Joint Assembly

New Joint Assembly

The Union road joint and dowel assembly unit, made by Union Steel Products Co., Albion, Mich., enables the contractor to assemble the joint filler, the dowels and the caps along the side of the road, so that the complete as-

sembly can be quickly placed.

A feature of these joint units is that the wire forms are so put together that the dowels are held parallel to each other, to the subgrade supporting them and at right angles to the cross joint through which they pass. This aligns the dowels in such a manner that when the adjacent slab moves, due to a change in temperature, the movement of the adjacent portion is in exactly the same plane as the line of the dowels and therefore the dowels serve to keep the pavement aligned and to transfer the load from one slab to the next. Lateral rods support the dowels and the clips tie the dowels in alignment, both horizontally and at right angles to the joint. The V formed in the supporting wires directly under the joint permits the free



The Windrow-Evener

movement of the road slabs. The vertical pins center the bottom of the joint.

Literature describing these road joint assembly units, which are made to meet any state specifications, may be secured by those interested direct from the manufacturer by mentioning this magazine.

A 27-Mile Road-Mix Contract in Arkansas

(Continued from page 5)

the road at a uniform rate of 16 cubic yards per station and was dried to a total moisture content of less than 2 per cent by manipulation with an Adams blade pulled by an Allis-Chalmers SO tractor, assisted at times by one or more patrollers.

After reaching a sufficiently dry state the aggregate was evened, using a windrow-evening built on the job and pulled by the same tractor used for drying. This windrow-evening was remarkably successful in securing a uniform distribution of mineral aggregate per linear foot of road and cannot be too highly recommended as a means of securing this uniformity which, when coupled with careful distribution of asphalt, gives the desired uniformity in the final mix.

When the windrow had been spread to a uniform cross-section 10 feet wide, samples one foot in width and of a length equal to the width of the windrow were cut from it at 500-foot intervals, using a windrow-cutter designed by L. C. Brown, Resident Engineer, which worked quite satisfactorily. These samples cut from the windrow were weighed and screened and the values thus obtained were used as the basis for the design of a mix. The degree of uniformity obtained by the use of the windrow-evening is indicated by the fact that the maximum and minimum weights of these windrow samples varied less than 5 per cent.

The mix was varied, according to the grading of the windrow samples, from 4.3 to 4.8 per cent of residual asphalt by weight and the results obtained indicate that these proportions are quite satisfactory for comparable conditions.

Application of Bitumen

Asphalt was applied to the evened windrow in three applications, using the same distributor mentioned above except that, instead of the 21-foot long spray-bar, an offset double bar 10 feet long was used. The offset bar was used because it was impossible for the distributor to maintain a constant road speed when running in the windrow of loose dry aggregate and the bar was doubled to provide a sufficient number of nozzles to enable the asphalt pump to deliver its rated capacity of 250 gallons per minute to the windrow. This discharge was kept constant and the variation in the amount of asphalt per linear foot of windrow as called for by the various mixes used was obtained by varying the road speed of the machine.

Under average conditions one distributor load gave one application of asphalt to approximately 900 linear feet of windrow, and to reduce the number of joints six of these sections were ordinarily shot in succession before the second and third application was made to any of them. A drag, carrying a double line of plows spaced at 1-foot intervals, was pulled by a Ford truck immediately behind the distributor. This implement, made on the job, started the mixing and covered the applied asphalt so thoroughly that there was little loss of volatiles before the final application of asphalt and the beginning of mixing with the multiple-blade machine.

The distributor was fed by booster tanks of 1,000-gallon capacity mounted on Ford trucks and the number used was so correlated to the length of haul that there was no waiting for asphalt. Ordinarily the six sections, which approximated 5,400 feet in length and required 18,000 gallons of liquid asphalt at the applied temperature of 140 degrees, were shot completely before noon, leaving the distributor free for priming

(Continued on page 35)

POWER!

both give bigger gear up mers use t to pay-out-ster use is—utes short ick ing t of row ots. mers to ast, do

rs all th



HIGHBALL HAULING by using A-C Speed Patrols to keep your hauling roads smooth and fills level. Thus you enable trucks and tractors to travel at higher speeds with bigger loads and with fewer time-wasting gear changes. You eliminate rain-catching pockets and so decrease bogging down on haul and fill. Here Hall & Mitchell, widening U. S. 1 near Richmond, Va., use a Speed Patrol to keep blasted material off the road, thus speed both traffic and their own hauling.

MOVE MORE BIG PAYLOADS—You get heaping loads in the Gar Wood scraper, move those loads at speeds up to 6.41 m.p.h. with the L or L-O tractor. Here Frank Eblen, long-time A-C fleet user and one of the first users of Model L tractors, goes to town on a job near Atlantic, Iowa, with three L-O's, two L-12 Gar Wood scrapers and one L-10. He moves dirt cheaper with **FASTER POWER**, that's why he's a repeat user.

ALLIS-CHALMERS

TRACTOR DIVISION—MILWAUKEE, U. S. A.

ALLIS-CHALMERS TRACTORS ARE AVAILABLE IN MANY TYPES AND SIZES. FOR A COMPLETE CATALOGUE OF ALLIS-CHALMERS TRACTORS, WRITE TO THE ALLIS-CHALMERS TRACTOR DIVISION, MILWAUKEE, WIS. 1, U. S. A.

Summer Time Is Repair Time For Minnesota's Snow Fleet

All Equipment Overhauled And Repaired in Summer; By September 1, Fleet Is Ready for Winter Work

✦ CONFIRMED in his conviction that it's not the time to fix the roof when it is raining, N. W. Elsberg, Minnesota Highway Commissioner, sees to it that his department has its snow-fighting machinery on the line and ready to go months before the first snowfall. Consequently, June and July are repair months for the Minnesota Highway Department's blizzard-busting equipment.

Despite consistently heavy falls of snow, tie-ups in the Gopher state system have not occurred in any section during the last five years for more than a few hours. And this includes years when the fall has averaged 12 feet in some sections and where 20-foot drifts have had to be plowed and repowed. In this respect, the winter of 1936-37 was the most difficult and costly snow removal season in the history of the department, \$1,750,000 being spent to keep the highways open. Last winter's snowfall was unusually light in most sections of the state, but recurring sleet storms made the problem of ice removal unusually serious.

Equipment To Be Maintained

Minnesota's snow removal fleet numbers 404 units and when all are in use, which during the winter is much too often for the good of the Maintenance Division's budget, 1,700 snow fighters are required to man them. When the state's 11,350 miles of trunk highways are blanketed by snow, the fleet costs slightly more than \$2,000 an hour to operate.

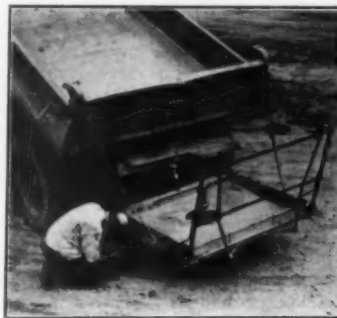
The snow squadron is composed of 14 rotary plows, 375 V-type and one-way plows and 15 tractor plows. In addition, the department has 126 motor patrols which are used in winter to shear ice off hard surfaced roadways. This equipment is sufficient to keep Min-

nesota's trunk roads open to traffic during even the heaviest storms. When visibility permits, it is Minnesota's policy to start plowing during a blizzard and not to wait until it has ended.

The department also has 45 rotary sanding machines for frictionizing curves and hills during the ice period and, each fall, 1,200 miles of snow fence, the equivalent of a fence from the south boundary of the state to the Gulf of Mexico, is placed along stretches subject to consistent drifting.

Organization

Minnesota's trunk highway system is



A Minnesota Highway Department Mechanic Checks Over a Rotary Sander to Be Sure It Is Fit for Winter Duty

divided into 16 districts, each with a construction engineer, a maintenance engineer and fully equipped machine shops located in the most conveniently situated town of the district. The department does not operate on a central-shop plan, and in size each of the district shops compares with the others. All

snow equipment is stored in these shops and operates out from them.

In the spring, snow fence is rolled up, placed on planking and left near its winter site, as the cost of transportation to and from the shops is prohibitive. Damaged fence is taken into the district shop for repairs and the rest summers on the planks. Strangely, the department has suffered little from theft of fence left thus.

Welding Important in Repairs

All repairs of equipment are done in the district shops by experienced department mechanics. No repair work is jobbed out. Twelve of the 16 shops are equipped for arc welding and by the summer of 1939, Commissioner Elsberg expects to have arc welders in all shops, as they are constantly needed for plow welding.

The majority of the plows which come into the shops for repairs have been damaged during the early spring. In some sections, snows continue to come

(Continued on page 27)



WHO STARTED THIS SWING- TO ALLOY ROLLED STEELS? IN EXCAVATOR DESIGN?



The only $\frac{3}{4}$ yd. machine on the market mounted on true tractor-type crawlers.

17 DIFFERENT MODELS
ranging from $\frac{3}{8}$ to 5 cu. yds.
capacity with 7 attachment combinations.
Gas, Diesel or electric power.
Write for literature on the size and type you need.

● Certainly, we would never go back to the old style excavator construction. Nor do we blame others for gradually abandoning it in favor of alloy steels. But we do take a little pride in the fact that P&H originated this new type of construction in the excavator industry. And our long experience with electric arc welding, convinces us that P&H design and construction is "five years ahead of the field." The inspection of one of these new P&H Pacemakers will convince you, too. Write the Harnischfeger Corp., 4419 W. National Avenue, Milwaukee, Wisconsin.

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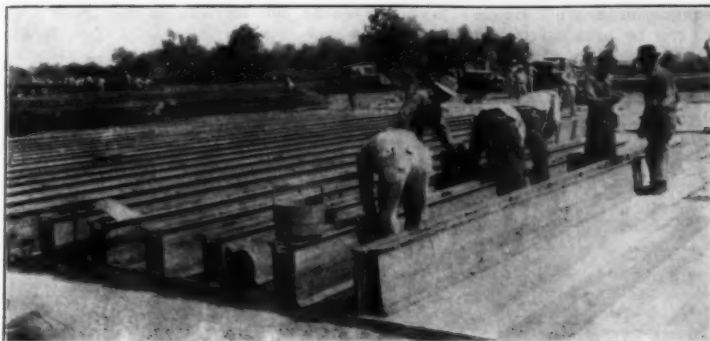
A REAL TIME AND LABOR SAVER

This is the first tried and proved excavator for accurately and economically digging the subgrade for pavement widening construction. At the rate of a mile or more per day, it cuts subgrade ready to receive the road materials.

Model 16-B cuts 12" to 27" wide.
Model 16-B-A cuts 12" to 48" wide—two or more cuts give any width needed.

Write for complete data.

THE BUCKEYE TRACTION DITCHER CO.
FINDLAY, OHIO.



C. & E. M. Photo
Assembling the Forms for the Piles for the West Approach

Novel Methods Speed Work at Baton Rouge

(Continued from page 10)

before each use.

The steel cages were placed in the forms by the steel men, twenty-two being required to lift, carry and slide the unwieldy "boa constructor," as it was called by some of the negro laborers, carefully into the prepared forms without damaging the forms.

The Concrete Plant

The concrete mixing plant consisted of a Northwest crane with a 40-foot boom and 1-yard Owen bucket handling the sand and gravel from stockpiles to the bins of the Johnson batching plant beneath which was a 1-yard Ransome non-tilting mixer. The cement was handled from a storage shed by sliding down a roller conveyor. Two men handled the rolling of the bags, two men emptied them into the batches and one man pulled the concrete down the chute into the two shuttle trucks. The batches consisted of 1,473 pounds of dry sand, 1,866 pounds of dry gravel and the 6 bags of cement. From 26 to 30 gallons of water was used per batch, depending on the moisture content of the aggregates. The water was measured volumetrically; all other materials were weighed. One man operated the crane and one man handled the entire batching operation through pneumatic controls. At the end of each day the batch man cleaned the entire mechanism, beams and controls with compressed air to remove the fine dust.

In front of the mixer and between the inspector's shack and the plant was a depressed roadway with concrete runways and concrete retaining walls. This was necessary as the ground water level in this section is only about 2 feet below ground level. The roadway was pumped out regularly.

Pouring and Driving Piles

The two hydraulic dump trucks which shuttled between the concrete plant and the casting yard backed up one of the two short runways to permit dumping into small hoppers from which the concrete could be run into the dozen rubber-tired "aristocrat" wheelbarrows which were manned by negro laborers. Each pile required 3.15 cubic yards of concrete and this crew placed the concrete in 33 piles in four hours and nearly doubled this in an 8-hour day.

A 12-inch plank over the forms served as a runway for the wheelbarrows and the material was dumped into the forms as indicated by the foreman. Two shovelers at the forms cleaned the concrete that spilled onto the runways but were not required to handle the concrete in the forms at any time as the two Master No. 12 electric vibrators with over-drive to give 4,750 rpm moved the concrete in no uncertain manner along the forms and around the reinforcing. The average placing of the concrete was actually 22 yards an hour. Three men

hand-floated the top surface of the piles immediately after pouring.

The forms were stripped in 24 hours by removing the 6-inch planks between the forms, knocking down the spacers and then pulling the forms away from the piles. The piles were left in place and sprayed with water for 14 days. The

forms were cleaned with wire brooms and re-oiled for assembly in another location for casting the next set of piles.

The piles were moved from the casting yards as required by a Bucyrus-Erie crane with a 3-point spanner with equalizing tackle and set into the leads of the pile driver by the same crane for driving with a No. 1 Vulcan steam hammer.

Prior to the driving of the piles the footing excavation was made to a depth of 5 feet and from 9 x 10 feet to 13½ x 15 feet. A template was then placed in the excavation for the spacing of the piles and then they were spotted and driven to carry a load of 20 to 22 tons each. The test piles, both 16 and 18-inch, failed at slightly over 80 tons in the test loadings.

Personnel

On this subcontract for the casting and driving of the concrete piles for the foundations of the approach trestle, F. T. Leeder was Superintendent of casting operations and W. E. "Jerry" Fuller was Superintendent in charge of pile driving

for E. A. Whitney & Sons of Kansas City, Mo. This contract is part of the Mississippi River Bridge Project at Baton Rouge, La., for which E. L. Ericson, Assistant Bridge Engineer, Louisiana Highway Commission, is Engineer in Charge, and on this contract George Robert was Resident Engineer. H. B. Henderlite is State Highway Engineer, and N. E. Lant, Bridge Engineer, for the Commission.

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Concrete Delivery Co.,
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International Pick-Up Trucks
are handy units for carrying
light loads, tools, supplies, etc.

INTERNATIONAL TRUCKS



Walraven Bros. Used These Two Excavators to Handle an Unusual Job

Two Excavators on Small Excavation Job

By using two excavators, one equipped as a shovel and the other as a dragline, Walraven Bros., excavating contractor of Bay City, Mich., handled a small but tough excavating job profitably. The job involved the excavation for an 11-foot diameter gasoline tank which had to be 3 feet underground, requiring the digging of a pit 14 feet deep x 38 feet long x 28 feet wide. The heavy blue clay was too tough to be handled by a dragline alone and the job was too small to warrant building a ramp to permit the use of trucks. In addition, the excavated material had to be replaced to cover the tank and graded.

The contractor put two Bay City 1/2-yard excavators on the job. A new Model 25 shovel loosened the heavy blue clay and piled it in a corner so that the Model 30 dragline could pull it out. While this method meant double handling of the material, the job was completed in 8 hours, more than 550 cubic yards of excavation being handled in that time.

New Semi-Trailer Bottom-Dump Wagon

One of the features of the new Insley Model D semi-trailer bottom-dump wagon, recently announced by the Insley Mfg. Corp., Indianapolis, Ind., is the electric control for the doors. To open the doors and drop the load, the truck driver pulls the trip lever in the cab which releases the ratchet holding the winding drum and the door-supporting cables. After the load is cleared the doors are closed by the operator pushing

a button on the steering wheel. This sets in motion an electric motor mounted on the front of the wagon and which is geared to the drum on which the door-supporting cables are wound.

This motor is connected to the drum through an over-running clutch which protects the motor from dumping shocks. The motor is further protected by an automatic cut-out switch which cuts off the current by the tension in the cables when the doors are in closed position or when the closing is blocked by an obstruction. The doors are held securely in closed position by a strong gear and ratchet on the winding drum.

This 5-cubic yard wagon is of all-welded construction, mounted on semi-elliptical springs which, with the large single lug-type tread tires and Timken axle bearings, absorb the shocks of service over rough, uneven roads and when handling heavy loads. The unit may be equipped with vacuum brakes when hauling conditions require them. A special bolster with a ball and socket connection for the wagon tongue is provided for

mounting on the truck frame. This bolster can be attached to any standard light truck.

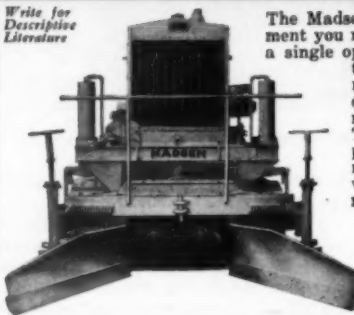
Bulletin No. 130, describing and illus-

trating the features of this Model D wagon, may be secured direct from the manufacturer by mentioning this magazine.

MADSEN

ROAD PUG

Write for Descriptive Literature



The Madsen Road Pug is the one piece of equipment you need to accomplish your road mixing in a single operation without sacrificing batch control. Operated easily by two men and running on economical diesel power, it delivers a product as consistent as plant mix using the same aggregates. The Madsen Road Pug exceeds in capacity. If you are contemplating road mix work, you owe it to yourself to investigate the Madsen process of road mix.

MADSEN IRON WORKS
Manufacturers
Huntington Park, California

JA-55 Largest of the New I-R Jackhammers



THE JA-55 Jackhammer is the latest addition to the JA family of drills. Larger and heavier than its younger brothers, the JA-30 and JA-45, it is a hard-hitting, fast-drilling tool designed for harder rock and deeper holes.

Unusually low air consumption, per inch of hole drilled, makes it an ideal drill for use with portable air compressors, or wherever the air supply is limited.

It is saving time and money for mines, quarries and contracts all over the world.

Ask for our new 80-page Rock Drill Catalogue No. 4201. It describes this drill as well as the entire I-R line of rock drilling equipment. 186 illustrations.

Other I-R Products include: Portable and stationary compressors, Jackbits, over 1500 types and sizes of rock drills and pneumatic tools, hoists, pumps and engines for mines, quarries and contractors. Let us help you with your problems.



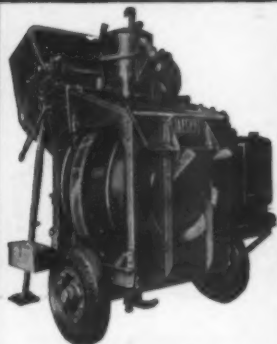
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Then and Now! Above Is One of the First Etnyre Road Oilers from the "Horse and Buggy Days" and, Right, the Newest Streamlined Blacktopper of 2,000-Gallon Capacity, the Product of Etnyre's 40 Years of Experience

Etnyre Celebrates Fortieth Anniversary

E. D. Etnyre & Co., Oregon, Ill., manufacturer of bituminous distributors and other road maintenance equipment, this year celebrates its fortieth anniversary. Founded in 1898 by E. D. Etnyre, father of the present officials of the company, to manufacture watering tanks for stockyards, the company soon expanded into the manufacture of road sprinklers and oilers. The sprinkler grew up into the present Etnyre flusher and the road oiler into the modern streamlined motorized Blacktopper distributor for road construction and maintenance.

After the death of E. D. Etnyre in 1933, his four sons all of whom were associated with the firm carried on the business. The present officers are Robert D. Etnyre, President and Superintendent; George M. Etnyre, Secretary and Treasurer; Horace H. Etnyre, Vice President and Production Manager, and Edward A. Etnyre, Vice President in charge of service.

Ford Announces New Cab-Over-Engine Truck

Featuring greater load space, driver comfort with short wheelbase, easy cab accessibility, conveniently arranged controls and openings for oil, water and fuel, a new cab-over-engine V-8 truck has been announced by the Ford Motor Co., Dearborn, Mich. This new truck is available in two wheelbase lengths, 101 inches and 134 inches.

The 101-inch wheelbase is offered with a stake platform body, dump body and as cab and chassis. The load space of the dump body is 84 inches long, 66 inches wide and 12.62 inches high and the capacity is $1\frac{1}{2}$ cubic yards. The 134-inch wheelbase model is offered with stake platform body and as cab and chassis. Both models are offered in the drive-away type for mounting special bodies.

Construction of the cab-over-engine truck is the same as the conventional models except for the necessary changes because of the cab-over-engine design. Most major parts such as power plant, rear axle, rear springs, steering gear, etc., are interchangeable. The forward position of the cab makes it necessary to locate the steering column farther forward as a result of which the base of the column is ahead of the axle and the drag link runs rearward to it. Due to the fact that the load center is farther forward and the cab is more directly over the axle, a front-end assembly of



greater ruggedness and strength is used.

Fuel and oil as well as water are replenished without raising the hood or opening the engine cover. The fuel filler tube extends outside the cab at the right rear corner while the oil filler tube protrudes through the engine cover inside the cab. An oil-proof rubber shield prevents fumes from entering the cab. Throttle and choke buttons are located back of the engine cover. The gear shift

and hand brake are curved forward so that they are operated by an up and down movement instead of the conventional forward and back movement.

How Hauling Scrapers Work

An unusual 8-page bulletin, describing and illustrating Adams hauling scrapers, available in 5, 6, 8, 10 and 12-yard sizes, has recently been issued by the J. D. Adams Co., Indianapolis, Ind.

In addition to a description of the features of these scrapers and illustrations of them on a variety of jobs, this bulletin contains some excellent diagrams showing exactly how these units dig and load, haul, dump, spread and level.

Copies of this bulletin, Form 3810, may be secured by interested contractors and state and county highway engineers direct from the manufacturer by mentioning **CONTRACTORS AND ENGINEERS MONTHLY**.

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A WIDE SWING!

THOSE extra few inches of boom swing may mean the difference between profit and loss when the contract is completed. MultiFoote Concrete Pavers have gained an enviable reputation for their ability to swing that boom around just a little farther than the ordinary paver. It is because of features like this that MultiFoote Pavers have become known for "Steady Footage"—smooth, continuous service hour after hour.

The famous MultiFoote Double Cone Drum—the high operating platform—synchronized operation—No Pressure Water Tank—These are a few of the reasons why there are more MultiFoote Pavers in service than any other make!

You owe it to yourself to investigate these MultiFoote Concrete Paver advantages before you buy any paver.

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For Stone
The Adnun Finish Spreader—a low cost machine that handles any material and shapes crown or bank. Ask about it.

For Black Top
The Adnun Black Top Paver lays any mix, any width, any thickness! The only Black Top Paver with 6 years actual service behind it. Catalog on request.

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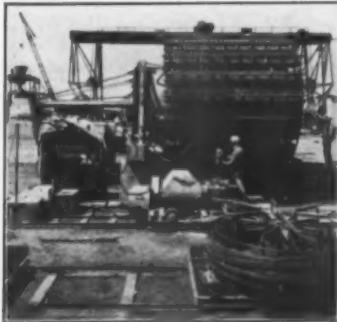


Endorsed and Adopted by Road Builders and Contractors

Level is easily and quickly attached to line. Special feature construction prevents accidental detachment from line. Construction is sturdy, and accuracy guaranteed.

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8531 Gratiot Ave. Detroit, Mich.

MULTIFOOTE CONCRETE PAVERS



Winding the Reinforcing for the Precast Concrete Pipe

World's Largest Pipe For Calif. Aqueduct

(Continued from page 16)

to 20 bars 18 inches long placed longitudinally reinforces the bell of each section. The completed cage weighs from 3,700 to 5,400 pounds.

Pipe Casting

The batching and mixing plant was located near the center of the yard, and was equipped with the latest devices for concrete production. Aggregate, obtained from a nearby commercial pit, was elevated into bins above the batchers to allow gravity handling. Cement delivered in bulk was stored in a silo of 1,800-barrels capacity and then elevated to a smaller bin above the mixer. All material was batched by delicately calibrated weighing devices controlled by electric eyes. Water was measured by meter.

The batches were mixed in a 4-yard Davis mixer which emptied into cars of 2-yard capacity that were transported by railroad locomotive. The track upon which the cars operated passed directly under the mixer. Each train consisted of two cars with 2-yard buckets and one empty car for receiving a third bucket which was left at the pouring gantry for handling while the train was away.

Along one side of the track and extending in both directions from the mixing plant was a line of 48 steel base rings set on concrete bottoms designed to receive the pouring forms. The plant was planned for a capacity production of 16 pipe sections per day. Three days were therefore required to pour the entire number of sections on the line of 48 basal rings. This permitted pouring to proceed continuously, for the pipe could not be moved from the rings for 72 hours. That period of time elapsed for the first 16 sections when the last 16 had been poured, and they could be removed to make way for the fourth day's pour.

An 18-foot track spanned this casting line, and upon it operated a pouring gantry which straddled the forms. The loaded cars pulled up along the gantry and a locomotive crane hoisted the 2-yard buckets and emptied them into the hopper above. Concrete was poured into the forms from the gantry through a swivel spout.

Handling Forms

The form assemblies were previously set up by the locomotive crane. It first set the inner form on the base ring, then the reinforcing cage, and then the outside form. The inner form was of steel with a collapsible section which allowed it to be removed easily. The outer form was made of a single steel plate with a bolted joint. All forms were cleaned and oiled between pours, the 16 pipes poured on the first day of the three-day cycle being stripped early in the morning of the first shift, which then assembled the forms for the next pour. The second shift made the pour.

As the concrete rose, external vibra-

tors were used around the outer forms to settle it and prevent pockets. When the pouring was completed the gantry moved on to the next form. Because ordinary vibration was not found sufficient to give the desired smoothness to the finish of pipe of such large dimensions, a further process was worked out. This procedure is one of the most interesting and important innovations in the pipe casting.

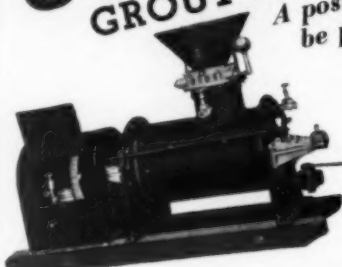
It consisted of putting down finishing rods inside the forms and rotating them along the inner and outer faces of the section. The rods were made of 14-foot lengths of square $\frac{1}{2}$ -inch steel with off-sets welded on at intervals to increase the agitation. They were rotated by small air motors, similar to those used for operating hand tools, for periods of about 20 minutes at a speed of about 700 rpm. This procedure practically does away with air and water pockets, surface defects, and results in a thorough compaction of the concrete. In these sections where a minimum of

(Continued on next page)

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A positive mix machine that can be profitably employed for--



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★ Cleveland Tampers are easy to handle. They carry their own load, do lots of work, and the men like to run them. By actual test, a pair of tampers saves more than \$20.00 a day over hand ramming, and that with compressor expense and all figured in.

★ You will want to try out a Cleveland No. 5 Back-fill Tamper on your own job. Let us know when and where. Bulletins on request.



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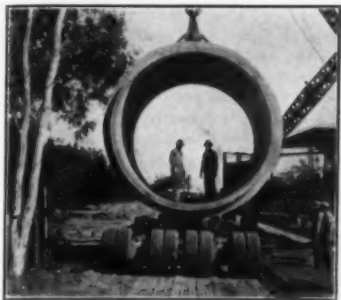
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LEADERS IN DRILLING EQUIPMENT



Unloading 12-Foot 4-Inch Pipe for a Section of the Colorado River Aqueduct

Special Methods for Huge Precast Pipe

(Continued from preceding page)

water was used, enough to give a slump of 4 to 5 inches to a batch of 6¾ sacks of cement per cubic yard, it would probably be impossible to effect the desired surface smoothness by methods usually employed.

Curing

Inside the base rings of the forms were two permanent pipe systems, one for steam and one for water. After the vibrating was completed, steam was introduced to the inside of the sections. This wet steam curing was continued for about 12 hours, and raised the temperature of the concrete to about 100 degrees F. The forms were stripped from the sections 12 to 16 hours after the pouring, and water was sprayed on the heated concrete from the inside, the top being kept covered. Two coats of cut-back coal-tar curing compound were applied to the outside as soon as the forms were removed. After this dried it was followed by a coat of whitewash to reduce heat absorption.

The sections remained standing on the base rings for 72 hours. During these three days the tops were kept covered and the interior was kept wet by the sprays. At the end of the period the sections were tipped to a horizontal position by the same gantry that was used for pouring, but before this was done a system of three expanding spider braces was fitted inside the pipes, one at each end and one in the center. These braces were made of heavy steel pipes. Wooden blocks with a trench jack at one end were placed against the faces of the pipes for tightening the assembly. This internal stiffening permitted the section to be rolled while it was still comparatively green.

The sections were tipped by means of a heavy girdle or yoke so designed that it tightened as the lift was exerted. The gantry merely tipped the sections, and after sheet-metal and timber heads had been placed over both ends, they were rolled on timbers to the curing yard.

Here the curing was continued by means of sprinkler heads placed inside the pipes. This continued for 12 days, the sprinklers being regulated by an automatic timing device which provided

intermittent sprays of 15 seconds every 20 minutes. The sprinkler heads were attached to lengths of rubber hose, which allowed the sections to be rolled forward as additional space was made by removal of cured pipe to the job.

Pipe Handling

From the storing yards the sections were transported to the job on low-bodied 50-ton trailers of special design, built by the Utility Trailer Mfg. Co., attached to diesel trucks. They moved at a rate of about 10 miles per hour through orchards and vineyards over a road built and maintained by the contractor. All sections were so placed on the trailers that no additional turning was necessary upon delivery at the trench.

Upon arrival the sections were lifted from the trailers by a stiffleg derrick operated by an American steam hoist, mounted on a 48-foot straddling gantry. A single sling lifted the pipe and lowered it into position in the ditch. It was pulled forward to the joint by a ratchet jack hooked to the pipe already laid.

Only about 15 minutes were required to unload the pipe and move it to its final position. About 16 sections per 8-hour day was the average number laid.

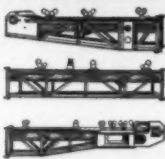
Two mortar fillings were provided at the joints, one centrally located being poured at once through a hole at the top of the pipe and rodded with a flex-

ible cable. The other, an open groove, was pointed from the inside of the pipe and was not completed until the backfill had been made and settling had taken place. This was to prevent cracking.

Before the mortaring of the joints a concrete cradle was poured to support

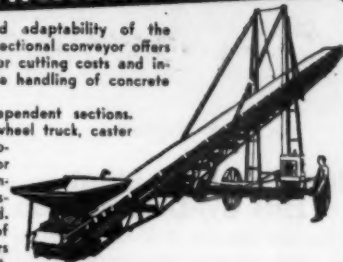
(Continued on page 32)

NEW WAYS TO CUT MATERIALS HANDLING COSTS



The flexibility and adaptability of the Porta "Model 347" sectional conveyor offers wide opportunities for cutting costs and increasing profit in the handling of concrete and aggregates.

Made up of independent sections. Can be used on wheel truck, caster mounting or on supports as permanent or semi-permanent conveyor. Easily disassembled, easily transported, easily reassembled. Our catalog describes our complete line of portable, sectional, and permanent conveyors designed to suit every contractor's requirement.



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Power Multiplied at the Blade — is the Important and Exclusive Advantage Controlled Traction Gives the Owner of a "99" Motor Grader

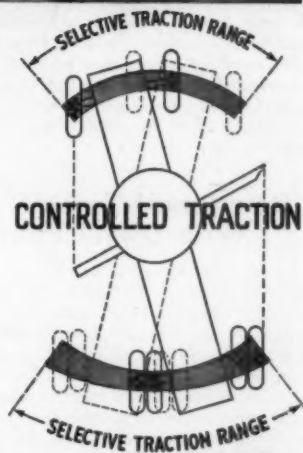
● Power that side-thrust would ordinarily waste, is put to work. That is why the "99" can take DEEPER plow cuts, move LARGER windrows FARTHER, scarify HARDER material, and plow through frozen or caked snow easily... The unusual task or difficult ground conditions present no problem!

Sketch at right illustrates how frame can be offset either way to control traction and neutralize power-consuming side draft. By steering the front and rear wheels, wheels can be positioned anywhere within the areas marked "Selective Traction Range"—to distribute driving power over entire blade, from toe to heel.

Whether the "99" works in blow sand or mud, down in the ditch or up on the bank—on sharp elevated winding roads or narrow mountain trails, performance records prove it to be an exceptionally fine investment. Write us for full details.



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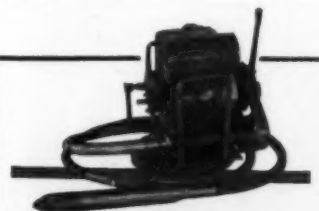
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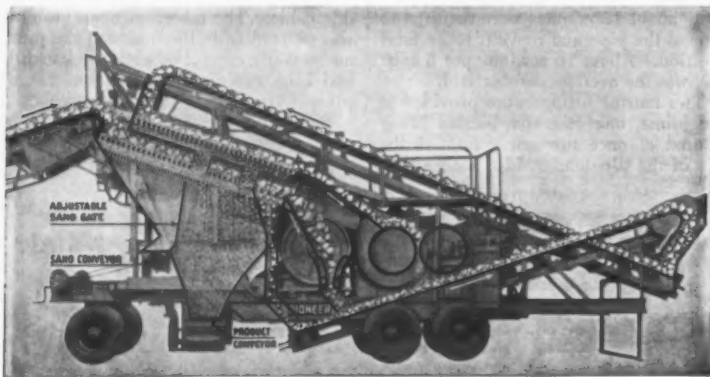
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Concrete VIBRATORS AND GRINDERS

Write for Circular on types, sizes and prices

White Mfg. Co.
ELKHART INDIANA



The New Pioneer 48-V Crushing Plant, Showing the Path of the Material

New Crushing Plant Has 3½-Deck Screen

The new Pioneer 48-V duplex crushing plant, recently announced by the Pioneer Engineering Works, 1515 Central Ave., Minneapolis, Minn., has a 4 x 12-foot inclined vibrating screen, a 1036 SKF-bearing jaw crusher and a 40 x 22-inch Timken-bearing roll crusher.

This unit, which is the largest of the Pioneer portable plants, has a number of new features. The angle of the screen has been lowered to 18 degrees and the direction of the rotation is with the flow of the material, reducing overall height and increasing screen efficiency. An overhead swivel drive that lowers the height of the feeder conveyor and feeds the material directly onto the screen has resulted in a shorter feeder conveyor and lower plant height. The screen has three and a half decks, the half-deck being added so that sand can be rejected without sacrificing screen area for the finished product. As with all Pioneer plants, the unit is equipped with a Conway disc clutch, fully enclosed and easy to adjust. A by-pass is now available on vibrator plants to by-pass small rocks around the jaw crusher and direct to the roll crusher.

This plant will operate in gravel pits or quarries, alone or following a primary crusher. It rejects any desired percentage of sand and will produce crusher chips simultaneously. The unit can be fed with shovel, dragline, scraper or trucks and the finished material goes directly to trucks or storage bins.

A new 8-page booklet, containing complete information on this Pioneer duplex crushing plant, may be secured by interested contractors and state and county highway engineers direct from the manufacturer by mentioning this magazine.

A New Small Tractor With Diesel Power

A new track-type tractor, known as D2, was recently announced by the Caterpillar Tractor Co., Peoria, Ill., to supplement its line of diesel-powered tractors. Developing 25.5 hp at the drawbar, this new tractor will handle appropriate-sized blade graders, small maintenance machines, terracers, roll-over scrapers and similar loads. On this type of work, under average conditions, the engine uses only 1¼ gallons of low-cost fuel an hour, according to the manufacturer.

The D2 diesel tractor has a 4-cylinder 4-stroke cycle engine, with a bore and stroke of 3¼ inches x 5 inches. To insure quick starting of the engine, even under adverse conditions, an independent 2-cylinder horizontally-opposed 4-cycle gasoline engine is used. This engine, with a bore of 2¼ inches and a 3-inch stroke, develops 10 hp at 3,000 rpm, offering ample power to turn the diesel engine against full compression until a desirable starting temperature is reached. One of the features is a hot-water manifold on the front side of the fuel filter housing, keeping the diesel oil

at the proper temperature, regardless of climatic or operating conditions.

Another feature of the D2 is the twin radiator, one section for cooling the water and the other for cooling the lubricating oil. Increased leverage on the steering levers makes the D2 tractor very easily steered, flexible and easily maneuverable under all conditions. The master clutch is hand operated, and the entire tractor is accessible for maintenance and necessary adjustments.

Under-Truck Scraper For Road Maintenance

Root spring scrapers, in a number of sizes for mounting on 1½ to 7-ton trucks, for use in maintaining dirt or gravel roads, are made by the Root Spring Scraper Co., Kalamazoo, Mich. Blade lengths for the 1½-ton trucks are 8, 9 and 10 feet and for the heavier models, 8, 9, 10, 12 and 14 feet long, all of them with one or two-piece blade and one or two cylinders as desired.

The oil-hydraulic operation is self-lubricating and simple and is used only to force the blade down. Lift springs raise the blade, which design keeps the blade in uniform cutting or floating position at all times, according to the manufacturer.

Literature describing this road maintainer, as well as the Root shoulder maintainer, may be secured by interested state and county highway engineers direct from the manufacturer by mentioning CONTRACTORS AND ENGINEERS MONTHLY.

Largest Crane in U.S. Places Overpass Beams

(Photo on page 36)

Girders 140 feet long x 12 feet deep and weighing 88 tons each were lifted into place in the Winans overpass on the main line of the Pennsylvania Railroad in Baltimore recently by means of the largest crane in the country. This crane, which was used in the construction of the George Washington Bridge over the Hudson River and more recently in the construction of the Golden Gate Bridge, was brought east by the Bethlehem Steel Co. to handle two of the largest steel girders ever made in the United States.

The overpass, carrying Baltimore-Washington traffic, crosses the three-track railroad at a diagonal and will carry a 50-foot concrete highway. The project, which will cost about \$390,000, will be completed this fall and will replace the present two-lane overpass.

One of the features of the job of swinging these huge girders into place was the fact that only an hour and a half was available for the task, the longest daylight period between scheduled trains. The contract for the overpass is being executed by the Bethlehem Steel Corp., under the supervision of Walter Hopkins, Bridge Engineer for the Maryland State Roads Commission.

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GIANTGRIP
STRAIGHTEDGE

Either Steel or Aluminum

For Checking Concrete Surface

Two useable edges:—one sharp-cornered and squared for scraping; the other rounded for line-point straightening.

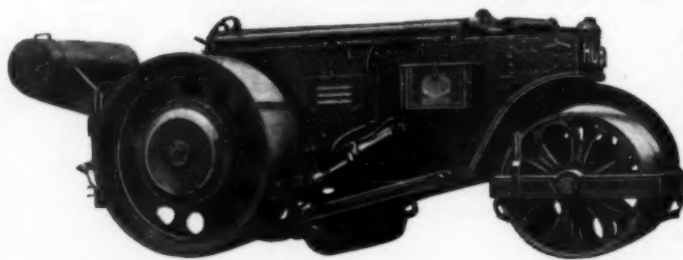
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Sturdy construction combined with many modern and exclusive features of design account for Huber's lower operating costs—lower maintenance—plus the extra speed which enables it to do a better job in less time. Huber Road Rollers invite comparison. Buy by comparison—and you will buy a Huber.

Write for Bulletins describing these modern machines in detail.

THE HUBER MFG. CO., MARION, OHIO

Buy a Huber

6 Sizes—5 to 12-Ton—Gas or Diesel



Standardize on Heil Equipment

Highway Officials know from experience that they can depend on Heil Hydraulic dump units to dump any load—anywhere—anytime—that's why each year more users are standardizing on Heil Quality Built Dump Units. The newest addition to the Heil line is the Dig-N-Carry Hydraulic Scraper (illustrated left above). This, too, is an efficient dirt moving unit that establishes new standards for comparison. Write or phone for complete facts. Address:

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THE HEIL CO.

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HOISTS - BODIES - TANKS
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OIL BURNERS - WATER SYSTEMS



A Motor Patrol Under Repair. This Type of Blade Is Used to Shear Ice Off Minnesota's Trunk Highways in Winter

Minnesota Snow Fleet Made Ready for Winter

(Continued from page 20)

after the spring break-up and in plowing this blanket the plows run afoul of hidden frost heaves. Torn and twisted wings comprise the most prevalent type of damage. Here the arc welders play an important part.

Reflector Buttons a Winter Hazard

As a safety measure, Minnesota uses road reflector buttons in the center of its paved roadway on curves and hills. Up to two years ago, these were left in the pavement throughout the winter. However, this practice was discontinued as many of the buttons were torn up by the snow plows and many plows were ditched and plows and blades damaged by the hidden reflectors. The cost of lifting and reinstalling these buttons each year is considerably cheaper than the button loss, anchor damage and snow plow destruction, department cost sheets have revealed.

Ready to Go September 1

While June and July are the snow equipment repair months, the work is done almost entirely during lulls in the routine work on open-season maintenance equipment.

In August, Commissioner Elsberg makes an annual inspection of the entire fleet and by September 1, plows, rotaries, sanders and ice blades are standing freshly painted, oiled and sound, ready to give battle to the drifts that visit Minnesota each winter as inevitably as tourists from the four corners of the nation do each summer.

New Crusher Bulletins

Four new bulletins on Universal crushing plants have recently been issued by the Universal Crusher Co., Cedar Rapids, Iowa. Bulletin No. 14 covers the 180-Q portable single crusher quarry plant with elevator screen, oversize return and bin, while Bulletin No. 28 describes and illustrates the 248-Q dual crusher quarry plant consisting of a primary jaw crusher and secondary

roll crusher on trucks, feeder conveyors, screen, oversize chute to the roll crusher, and bin.

Bulletin No. 34 contains data on the 66-G portable single-crusher gravel plant consisting of a jaw crusher, elevator, screen, mixing hopper, feed and loading conveyors mounted on a single compact chassis and Bulletin No. 37 covers Universal's 199-G single-crusher gravel plant consisting of a jaw crusher, bar grizzly and by-pass mounted over the crusher feed opening, pivoting bucket elevator and feed conveyor.

Copies of any or all of these bulletins may be secured by those interested direct from the manufacturer by mentioning this magazine.

Bridge Across Golden Horn

The construction of the Atatürk Bridge across the Golden Horn in Turkey is well under way. It is expected that this bridge, named for the President of Turkey, will be completed before the end of 1938.

STERLING BALANCED WHEELBARROWS

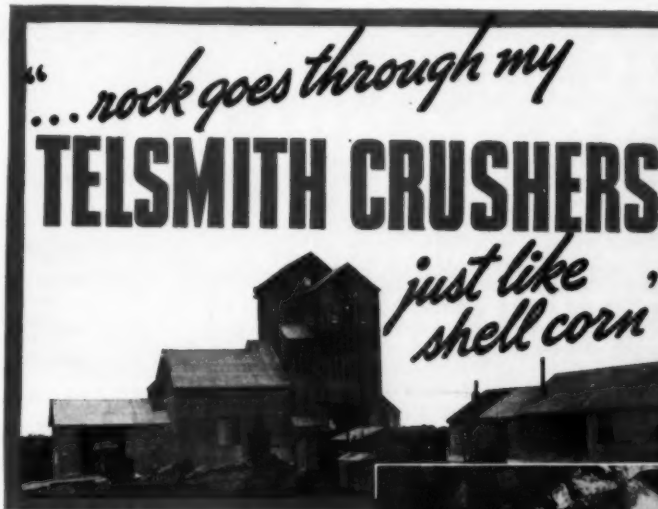


Greater part of
load balanced
over wheel

NO. S-18 CONCRETE BARROW

A COMPLETE LINE OF STERLING
WHEELBARROWS AND CONCRETE CARTS

STERLING WHEELBARROW CO., MILWAUKEE, WIS.



Pontiac Stone Co. plant, near Pontiac, Ill., owned and operated by A. E. Markgraf in association with his son-in-law, Leo E. Lamb. Equipped with Tel Smith Crushers, it crushes 140 — 150 tons of 97% calcium limestone per hour.



The 16-B Tel Smith Breaker (above) is set to crush to 3-in. size. After a stationary plate screen has removed part of the fines, aggregate goes to the No. 48 Tel Smith Gyrasphere (right) for reduction to 3/4-in. size.



A. E. Markgraf has operated crushers for over 25 years.

He says, "the Tel Smith Breaker crushes from the time the rock gets into the concave. With other crushers it gets half-way down before they do any work to speak of."

"The rock goes through my Tel Smith Crushers just like shell corn," says A. E. Markgraf. A quarry man for over twenty-five years, he knows his crushers. And he's had complete satisfaction with Tel Smith Crushers ever since he bought his first one, some 18 years ago.

In 1936 he bought a high-speed No. 16-B Tel Smith Primary Breaker for coarse crushing in his plant. His three trucks have been kept busy feeding it ever since... a 1000-ft. haul, 4 to 5 tons per truck-load... and as high as 26 loads in 17 minutes have been put through.

"Our demand for 3/4-in. rock became so great that we replaced two reduction crushers of another make, powered with 50 and 35-hp. motors, with a Tel Smith Gyrasphere which we powered with a 100-hp. motor, and practically doubled our capacity of small rock—yet we used less power with the Gyrasphere than with the other two," said Mr. Markgraf, "and we don't have so much slabby stuff." Why not find out for yourself why Tel Smith crushing equipment turns out a better product at the lowest cost per ton. Write for Bulletin Q-34. QC-2

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literature



C. & E. M. Photo
L. S. Peckham (Left), Superintendent on Hot-Mix Top, and L. W. Gove, Asphalt Plant Superintendent for Lane

Aggregates for Road Produced on the Job

(Continued from page 2)

After batching the aggregates at the Blaw-Knox plant beneath the bin at the aggregate plant, the trucks moved forward about 500 feet to the cement-batching plant where the cement was placed in separate metal containers. This was particularly necessary at the plant as the aggregates were dripping wet when batched and the cement had to be protected.

A fleet of five 3-batch and five 2-batch trucks was hired for the hauling. This was the maximum number required and was reduced as the work approached the location of the batching plants.

Laying the Base

In preparation for the pouring of the 8-6-8-inch concrete base 20 feet wide, the subgrade was carefully bladed with a Warco Road Hog, rolled with a 5-ton Buffalo-Springfield roller and then completed by hand by two fine grade crews each with scratch-boards. The gravel subbase had been put in by the same contractor two years ago under another contract.

Heltzel and Metaform steel road forms were set by the fine grade crew sufficiently ahead of the pouring which averaged 1,440 feet of 10-foot slab in 8 hours. One man dumped the trucks and cleared the skip of the MultiFoote 27-E paver, one man cleaned the grade immediately behind the paver and before the concrete was poured and also bent back the tie bars between the two slabs. These 48-inch bars were $\frac{5}{8}$ -inch round bars spaced 40 inches on centers and placed in the first slab poured, bent back against the steel forms and then when the second slab was poured they were bent out to bond the two slabs and prevent their separating.

Three puddlers spread the concrete and two men spaded against the forms. The bar-mat reinforcing was carried $1\frac{1}{2}$ inches below the top of the concrete during pouring by three angle irons pulled by the paver as it moved ahead. This method is preferred in Maine to the use of a strike-off on the grounds that the positive support of the mat insures correct position better than the strike-off method. The bar mats are of $\frac{3}{8}$ -inch round bars spaced 22 inches transversely and eight placed longitudinally.

One man shoveled concrete as needed to the screed of the Blaw-Knox gas-electric finishing machine while the spaders handled the placing of the bar mats. The two finishers cut the edge of the slab, used a 10-foot drag straight-edge, and finished high and low spots with a "sleeve-board" float. They also edged the expansion joints and used the steel broom for marking the pavement for the bond with the hot-mix top.

The expansion joints were set by two men every 40 feet, using $\frac{1}{2}$ -inch Johns-Manville cork expansion joint material against a steel slotted bulkhead on the side toward the paver, topped with an

equal-leg cap and held in place by three pins on the side of the bulkhead and a pair of clips to hold the cork joint tight against the bulkhead. The dowels through the expansion joint to bond the two sections of the slab were $\frac{3}{4}$ -inch round bars 2 feet long one-half painted with asphalt and with a 6-inch "tin whistle" cap on the side toward the paver. Ten dowels were set across the 10-foot slab.

The batches for this concrete were made up as follows: stone, 2,145 pounds; sand, 1,645 pounds; and cement, 470 pounds. The slab was cured for 9 days with 6 inches of hay wet for the entire time.

The Faithful Hot-Mix Plant

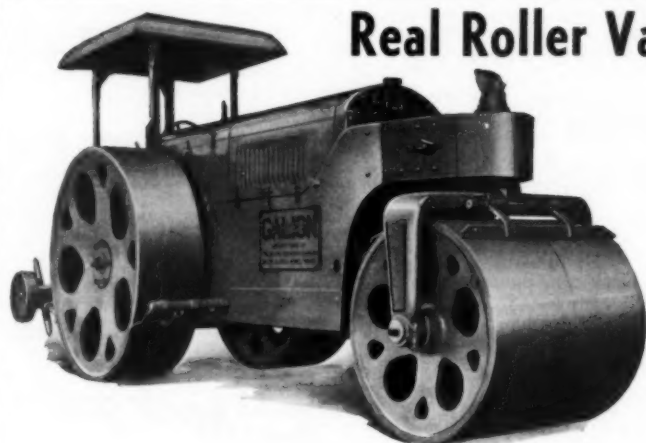
Few pieces of construction equipment except rollers have such a long record of production as the asphalt plant used by Lane on this job. It was purchased in 1915 for a contract running through South Hadley, Mass., and has served practically continuously ever since with very little replacement and rebuilding. L. W. Gove, Plant Superintendent for Lane, was a foreman on the South Hadley job when the plant was first put into service and is still responsible for the operation of the units. In spite of the fact that the plant was a little small for the size of this particular contract it kept up a steady production averaging 175 tons per 10-hour day with a maximum production of 218 tons. It is interesting also to recall that on the South Hadley job the hauling was done entirely with dump carts pulled by horses while on this job the 500-pound batches were piled into the motor trucks, sixteen batches to the load, and the steel bodies were oiled every trip with fuel oil.

A separate sand pit was opened for the fine aggregate for the hot-mix plant. This pit, $3\frac{1}{2}$ miles distant from the plant, was worked with a Sauerman $\frac{3}{4}$ -yard drag bucket pulled by a Clyde hoist into a storage bin from which the hauling trucks were loaded. As the pit was slightly deficient in the finest sand some was hauled in and blended in the pit with the other material. The $\frac{1}{2}$ -inch coarse aggregate for the mix was furnished by the Lynn Sand & Stone Co. and delivered by freight to Bowdoinham where it was unloaded by a Burch unloader to three of Lane's own Indiana trucks and hauled to the barricaded stockpiles from which it was fed with the sand through open ports to the

bucket elevator to the drier. One man controlled the flow of the material through the ports for each of the materials. The drier of the 1000-yard Cummer plant is 4 feet in diameter and 16 feet long and mounted separately on wheels for transportation. A single fuel-oil burner provides the heat for the drier and uses about 300 gallons daily. The dry material is delivered to the screens and bins by a bucket elevator.

The Socony asphalt used on this job was hauled from Portland, Me., by the contractor's own 1,000-gallon tank truck equipped with an asphalt pump. The asphalt was delivered to the two 1,000-gallon storage tanks at the plant by the truck's pump. The storage tanks were heated by separate coal fires. A Kinney asphalt pump at the plant circulated the asphalt through a loop so that it was maintained at the optimum

(Continued on next page)



Real Roller Value

Hydraulic steering alone makes the Galion Chief 3-wheel roller outstanding—but in addition you get a precision-built job with many other advantages to provide the utmost in service and economy.

Read about the heavy duty transmission, efficient differential lock, roll-a-plane attachment, powerful scarifier, and the choice of either gasoline or diesel power in Catalog No. 225, just off the press. Learn why the Galion Chief gives you real roller value.



THE GALION IRON WORKS & MFG. CO.

Main Office and Works:

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You'll find Michigan Truck Shovels working away in quarries and pits, too—right along with the "big fellows"! Truck mobility puts the Michigan on any location at a moment's notice—and for high production, Michigan Truck Shovels are real competition for larger machines because Michigan Fingertip-Air-Controls mean extra passes—and real savings—every day!

Write for Bulletin "CM" and "CM2"

in
Rough Stuff

MICHIGAN POWER SHOVEL COMPANY
Benton Harbor, Michigan

Concrete Base, Hot-Mix Top for Maine Highway

(Continued from preceding page)

temperature at all times and flowed to the asphalt weigh bucket at once when the valve was opened.

A three-beam Howe scale was used for the aggregate and was handled by one man; another ran the asphalt weigh bucket and worked on the dust filler. A checker on loads kept track of the trucks and weights of material delivered. The plant was run by a steam engine and a Goulds pump, taking water from a small pool in a spring-fed stream, delivered it to a 450-gallon tank above the boilers for both boiler feed and drinking water. Other labor on the plant included a fireman, a handy man and the foreman, making a total of six for the operation of the plant. The plant was operated 10 hours daily and 60 hours a week with the labor organization staggered to give the men the required 40-hour week.

The hot-mix batches were delivered to the trucks for hauling, uncovered, to the job at a temperature of 325 to 350 degrees. The batches were weighed out as follows: $\frac{1}{2}$ -inch stone, 301 pounds; sand, 162 pounds; lime dust, 9 pounds; asphalt, 28 pounds.

Spreading the Surface Course

Before the hot-mix was laid, the surface of the concrete base was sprayed with a tack coat of emulsified asphalt, using a hand-spray outfit and covering the entire surface of the slab with a light coating. The bottleneck of the entire contract was the capacity of the asphalt plant assigned to the work. The Adun spreader could handle the material much faster than it was delivered to the road and consequently the greatest care had to be taken in starting up after each load because the asphalt held in the spreader had cooled slightly. The trucks with the hot-mix backed up to the spreader and dumped enough to fill the hopper of the spreader and then the spreader laid down the $2\frac{1}{2}$ -inch loose material for compaction to 2 inches by the rollers. An 8-ton Buffalo-Springfield tandem was used for the initial roll followed by a 10-ton, 3-wheel roller of the same make.

The men required for the top surface were three men on the tack coat, who also swept the concrete base clean before spraying the asphalt, two rakers behind the machine and one edge man who shoveled the earth from the shoulder against the edge of the hot-mix as spread, and the Adun operator. The final operation on the surface course was the hand casting of $\frac{1}{2}$ -inch stone over the surface after the first rolling. The stone was first coated with asphalt at the plant and hauled out in a single pick-up truck. This gave an added amount of aggregate in the surface for greater non-skid qualities. A driver and a man scattering the stone made up this crew. It is not easy to scatter this material uniformly by hand but the man had acquired considerable skill and made it look almost like a machine job.

Major Quantities

The major items on this contract included the following:

Earth excavation.....	7,000 cubic yards
Structure excavation.....	800 cubic yards
Rock excavation.....	30 cubic yards
Common borrow.....	4,500 cubic yards
Gravel borrow.....	5,000 cubic yards
Bituminous-concrete surface course.....	80,200 square yards
Cement concrete base.....	13,850 cubic yards
Steel reinforcing for concrete base.....	891,800 pounds
Tack coat, applied.....	80,200 square yards
Trimming slopes.....	31,000 square yards
Bituminous treatment.....	10,000 gallons

Personnel

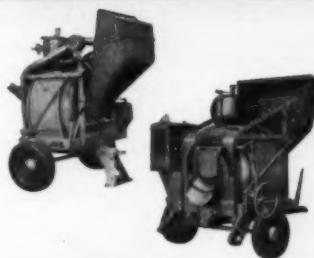
This contract was awarded to the Lane Construction Corp., of Meriden, Conn., on its bid of \$208,716.50. Grading of the 6.83-mile project was started July 6, 1937, concreting was begun July 16, 1937, and the first black-top hot-mix went onto the concrete base on August 11. The contract allowed 90 working days for the completion of the work. For the Lane Construction Corp., J. R. Wylde was Superintendent on grading and concrete, L. S. Peckham, Superintendent on hot-mix top, and L. W. Gove, Asphalt Plant Superintendent.

For the State Highway Commission of Maine, Lucius D. Barrows, Chief Engineer, the field work was in charge of Frank V. Wright as Resident Engineer.

The importance of proper lubrication can not be stressed too often. If you have any special lubrication problems, write the Editor.

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These features behind GAR WOOD'S champion low cost performance, are winning the respect of contractors in every section of the country.

Gar Wood "L 12" and Allis Chalmers "L 0" getting that last pound of dirt before speeding to the fill.

1. Hydraulic down pressure on the cutting edge assures positive digging in hard soil.
2. Automatic spring lift raises blade instantly without consuming any tractor power.
3. The ability to shorten the wheelbase when hauling gives maneuverability and greater speed when going to the fill.

4. Gar Wood's control of depth of spread is independent of the dumping angle of the bowl.
5. Hydraulic down pressure has the advantage in hard soils over the scraper which depend on only weight for digging action.
6. In spreading position the cutting edge is comparable to a grader or bulldozer blade.



12 yd. Gar Wood in digging position, with hydraulic down pressure exerted on cutting edge.



Gar Wood scraper in carrying position. Note the spring release feature which lifts the blade and shortens the wheelbase for maneuverability.



Gar Wood in dump and spread position, here the cutting edge is comparable to a grader or bulldozer blade.

For complete details, see your Allis-Chalmers equipment dealer or write for Bulletin R135.

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SCRAPERS • TRAIL BUILDERS • BULLDOZERS • RIPPERS • SNOW PLOWS • TAMPERS

New 3½-S Mixer

A feature of the new 3½-S Mascot mixer, recently announced by the Kwik Mix Concrete Mixer Co., of Port Washington, Wis., a subsidiary of the Koehring Co., is its compact construction, with an air-cooled gasoline engine mounted within the natural overall dimensions of the mixer proper. The end discharge permits wheelbarrow spotting without turning or backing. The Mascot has all-welded construction and is equipped with anti-friction bearings. The unit is

light in weight, weighing less than 1,000 pounds, and is mounted on two wheels, either of pressed steel or with cushion or pneumatic tires.

Complete details on this new concrete mixer are found in a 4-page folder, copies of which may be secured direct from the manufacturer.

Limited Edition of Road Book

Some time ago Caterpillar Tractor Co., Peoria, Ill., published a book, "Roads, Canals and Embankments with

Caterpillar Equipment" written by F. A. Nikirk, a civil engineer of long experience in the design and construction of engineering projects before he joined Caterpillar in 1927. The book was printed as a limited edition, designed purely for reference and for use in the export field for study of American methods.

Already Caterpillar has received numerous requests for copies, so that arrangements have been made to make this book available to state and county engineers and contractors, at fifty cents

a copy, which is just enough to cover the actual cost of printing and mailing. The book covers very thoroughly the methods of constructing different types of earth work with tractor and dirt-moving equipment.

Road Conference Postponed

The Third Pan American Highway Conference, originally scheduled for September, 1938, in Santiago, Chile, has been officially postponed until January, 1939.

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helps make contract schedules**

TO HELP AVOID the expensive job of repairing construction equipment in the field and the even more costly item of lost time through idle shovels, bulldozers or trucks, Standard offers an Automotive Engineering service that should interest every contractor operating gasoline or Diesel powered equipment.

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One of the New Mall Gas Engines Furnishing Power Through a Flexible Shaft for Concrete Surfacing

Special Paint Makes Signs Visible at Night

The feature of Prismo traffic direction and warning signs, made by the John R. Wald Co., Huntingdon, Penna., is a special semi-plastic paint, the surface of which is loaded with microscopic spheres which reflect the color of the paint into which the lower half of these spheres is fixed.

Obstruction markers made by this company consist of heavy weather-resistant cloth, marked in alternate diagonal black and white stripes on a 45-degree angle, to which the Prismo paint process has been applied. These markers and the signs are sold ready for erection or affixing.

Prismo traffic laning for producing a luminous traffic stripe readily visible at night consists of the paint containing the spheres and is sold in bulk. A special stripe-painting device is also available.

Complete information on these materials for making signs, obstructions and traffic stripes readily visible at night may be secured by interested state and county highway engineers direct from the John R. Wald Co. by mentioning this magazine.

New Equipment Co. Handles Buckeye and Emsco Lines

A new corporation, the Allied Tractor Equipment Co., has been formed with headquarters at Findlay, Ohio. This organization will be the exclusive sales agency for the Tractor Equipment Division of the Emsco Derrick & Equipment Co., Los Angeles, Calif., and in addition will handle the sales, in a number of territories, of Buckeye Clipper shovels, material spreaders and road-widening machines, made by the Buckeye Traction Ditcher Co., of Findlay, Ohio. The Emsco line includes cable and hydraulic bulldozers, trailbuilders, rippers, scrapers, tamping rollers and power control units.

Richard A. Wheeler, former sales manager of Emsco's Tractor Equipment Division, and Howard K. Biggs, also formerly connected with Emsco, are members of the Allied Tractor Equipment Co.

FOR SALE

1—Used Lorain 55 Electric Tunnel Shovel, equipped with 40-hp 440-volt 3-phase 60-cycle Squirrel-Cage Motor, short crawlers, short tail swing, 12-ft. boom, 10-ft. sticks, 1 1/4-yd. special rock tunnel dipper; Shop No. 4908. Excellent condition.

1—New 24' x 16' Telsmith Sand Drag.

Roanoke Tractor & Equip. Corp.
Roanoke, Virginia

Light-Weight Gas Engine

A new light-weight gasoline engine for the construction field has just been announced by the Mall Tool Co., 7743 So. Chicago Ave., Chicago, Ill. This new unit, which can be picked up and carried by one man, carried up a ladder, placed on a shelf or staging, or can be suspended from a rope or hook, is especially designed for furnishing power for drills, sanders, concrete surfacers, grinders and tool sharpeners.

Power is transmitted from the single-cylinder four-cycle air-cooled gas engine to the working tool by means of heavy-duty flexible shafting.

Stay in Business

This is the title of a 16-page booklet describing the all-year-round use of Le Tourneau equipment on construction and containing a number of actual job stories as well as illustrations showing Carryall scrapers, bulldozers, Angle-dozers, heavy-duty rooters, cranes and buggies on all types of clearing, grading, dirt-moving and snow removal work.

Copies of this interesting booklet may be secured by contractors and engineers direct from R. G. Le Tourneau, Inc., Peoria, Ill., and Stockton, Calif.

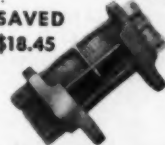
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P&H-Hansen Trailer Welders

150 AMP. — 200 AMP. — 400 AMP.

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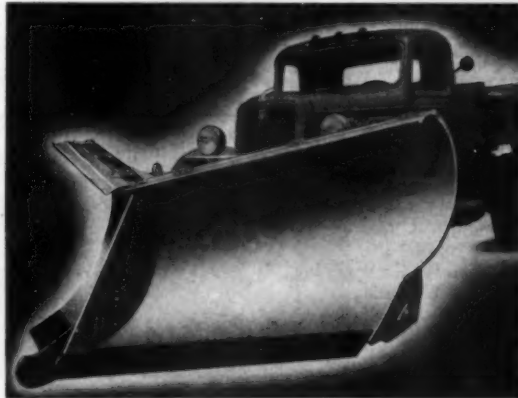
Instead of buying a new one, this corduroy shoe was repaired at 10% of its replacement cost.

Add up your replacement and maintenance costs for the past year for worn dipper teeth, broken castings and toothless gears on all types of equipment. It's a sum well worth saving, isn't it? You can save it, with one of these P&H-Hansen trailer welders. They're easy to operate, with patented single-current control—easy to tow from shop to field at normal traffic speeds, to bring fast repair service wherever you're working. Built in two or four wheel, pneumatic-tired types up to 400 amp. capacity. Send for Bulletin No. W-10. Address the Harnischfeger Corporation, 4419 W. National Ave., Milwaukee, Wis.

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ment are two reasons why Heltzel Steel Forms are conceded to be the most sturdy and reliable forms made. Over thirty years of consistent, successful road engineering has proven beyond any question the superior features of these self-aligning, fast-stripping steel forms. After five and six years of continuous, hard use Heltzel Steel Road Forms set as true and strip as easily as new forms.

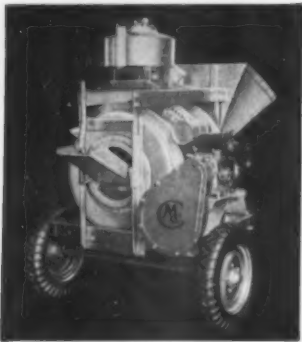
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SUBGRADE PLANERS
TOOL BOXES
FINISHING TOOLS FOR CONCRETE ROADS



The New CMC 3 1/2 End Discharge Concrete Mixer

A New 3 1/2 Non-Tilt End-Discharge Mixer

One of the features of the new CMC end-discharge 3 1/2 mixer recently announced by the Construction Machinery Co., Waterloo, Iowa, is its large production up to 40 yards a day, due to the new low front, high back and gated batch hopper, according to the manufacturer.

Other features of this new unit include balloon-pneumatic-tired wheels, Timken bearings, cantilever springs, disappearing tongue, air-cooled engine, accurate vertical syphon measuring water tank if desired, and CMC double-quick mix and re-mix action.

New literature describing this CMC 3 1/2 end discharger may be secured by interested contractors and state and county highway departments direct from the manufacturer.

New Bulletin on Truck-Cranes

The many sizes and types of P & H truck-mounted cranes and excavators are described completely in a new Bulletin TX-45 recently issued by the Har-nischfeger Corp., 4419 W. National Ave., Milwaukee, Wis. Nearly half of its 30 pages is devoted to action pictures, illustrating the use of these truck cranes on many types of jobs. Full page-sized photographs illustrate the entire mechanism of these cranes, and condense specifications and clearance diagrams are also included.

Copies of this bulletin may be secured by interested contractors and state and county highway engineers direct from the manufacturer.

World's Largest Pipe For Calif. Aqueduct

(Continued from page 25)

the bottom of the pipe. Concrete for this cradle was mixed in a paver which moved along the side of the trench and delivered the mix to a hopper on the top of the pipe. From the hopper it flowed by gravity through chutes down each side. The cradle width varied with the external load, central angles being from 100 to 180 degrees.

The ditch was from 18 to 28 feet deep, with slopes of about 1/2 to 1. The top soil was removed by a Caterpillar Seventy-Five tractor and Carryall, and the excavation made by a 3-yard Lima drag-line. The trench was opened up for only a short distance ahead of laying operations in order to prevent slipping of the banks, and excess dirt was trucked away. Backfill was made by the drag-line and Caterpillars with bulldozers.

Personnel

This pipe line was constructed for the Metropolitan Water District of Southern California. F. E. Weymouth, Chief Engineer, R. B. Diemer, Distribution System Engineer, and H. R. Bolton, Construction Engineer. The several sections contracted by the American Concrete & Steel Pipe Co. total about 16 miles. H. H. Jenkins, Vice President of the company, was in general charge of the work, with Don Rankin Superintendent.

When completed, the Colorado River Aqueduct will total a length of over 400 miles and will deliver a billion gallons of water a day to the cities of Southern California which comprise the Metropolitan Water District.

How to Join and Repair Pipe

A new 16-page booklet on the use of Dresser couplings and pipe repair products to join and repair pipe quickly and easily has recently been published by the S. R. Dresser Mfg. Co., Bradford, Pa. Dresser pipe couplings for joining new lines, and Dresser repair clamps and sleeves for repairing old lines are fully described.

Copies of this booklet, Form 382A, may be secured by those interested direct from the manufacturer.

New Electric Plants

The 1938 models of Onan electric plants, made by D. W. Onan & Sons, 43-51 Royalston Ave., Minneapolis, Minn., are complete, compact and light in weight. Sizes range from 350 to 5,000 watts, alternating or direct current, and dual voltage ac-dc units are also available.

These new electric units have a number of new improvements. Because of a new high-tension magneto used on all models, starting, particularly in cold weather, is easier. The weight and sizes have been greatly reduced, several models weighing less than 100 pounds.

One of these new units is the Model V5, a 5,000-watt 110-volt ac generating

plant, the feature of which is its 90-degree V-type 4-cylinder engine, operating at 1,800 rpm and developing over 15 hp. A battery ignition with a conventional automotive-type distributor is used. Lubrication is full force feed and all running parts are precision machined. The generator is of the self-excited type bolted directly to the engine, the armature being carried on ball bearings, and is forced air cooled. It is available with self-starting remote control or with full automatic control.

This and the many other Onan plants for providing electricity for tools or lighting on the job are described in new literature which may be secured direct from the manufacturer by mentioning this magazine.



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PORTABILITY and CAPACITY

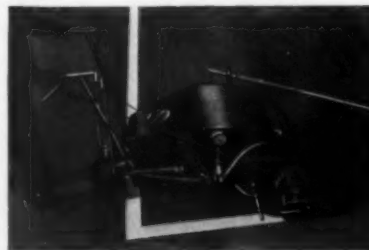
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PORTABLE
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The New Spring Lift Feature for Gar Wood Hydraulic Scrapers

Spring Lift Feature Of Hydraulic Scrapers

A spring lift mechanism, to prevent tractor stalling and loss of time in digging operations, is a new feature of all four models of Gar Wood hydraulic scrapers made by the Road Machinery Division, Gar Wood Industries, Inc., Detroit, Mich. When the cutting edge of the scraper bowl lip enters the ground, large loading springs are compressed. When the load increases and more power is called for, the operator touches the blade control lever and the cutting edge is raised from the ground. The springs, without consuming any tractor power, instantly reduce the cutting edge and relieve the drag on the tractor, thus leaving all of the power for pulling the scraper.

The two new Gar Wood models, the 6-yard K6 and the 8-yard S8, are being furnished with this spring-lift feature. The special alloy-steel construction of these two models, which supplant former models H6 and H8, provides more payload, less dead load and longer service at less cost of upkeep, according to the manufacturer.

New Safe Chain Hoist

One of the safety features of the new Coffing Safety-Pull chain hoist, which is claimed by the manufacturer, the Coffing Hoist Co. of Danville, Ill., to be "fool-proof," is the push button control. When the load has been elevated and it is desired to lower the hoist, the operator simply pushes in the button and the hoist's action is reversed. This control also acts as a safety stop; if the worker's hand should slip off the handle while operating, this device automatically and positively locks the handle before it can cause any damage.

Two other safety stops prevent the handle from whirling around and causing injuries to workmen. In the case of excessive overloads, hazards are avoided by the safety handle which bends before any other part of the hoist will give, serving as a warning to prevent the chain from breaking or hooks from straightening out and dropping loads.

Coffing Safety-Pulls, which are built on the old ratchet and pawl principle, are made for loads from $\frac{3}{4}$ to 15 tons and weigh from 14 to 150 pounds.

New Booklet on Graph Sheets

A new 88-page booklet describing and illustrating the complete line of Keuffel & Esser graph sheets, coordinate papers and cloths, has recently been issued by Keuffel & Esser Co. In addition, the booklet contains considerable information, with illustrations, on the use of the various types of graph and coordinate papers for different types of engineering data and charts.

Copies of this booklet may be secured by interested contractors and engineers direct from the Keuffel & Esser Co., Adams & Third Sts., Hoboken, N. J.

Four New Models of Light-Weight Pumps

The new line of light-weight self-priming centrifugal pumps recently announced by the Gorman-Rupp Co., Mansfield, Ohio, includes four different models, known as the Midget, the Bantam, the Hawk and the Eagle.

The Midget weighs only 52 pounds and handles 5,300 ghp; the Bantam, which weighs 79 pounds, handles 7,500 ghp; the capacity of the Hawk, which weighs 103 pounds, is 10,000 ghp; and the Eagle, weighing 118 pounds, has a capacity of 15,000 ghp. All four are rated at a total head of 20 feet, including a 5-foot suction lift.

These pumps are built on a new principle assuring rapid priming on all suction lifts up to a practical 25 feet as well as continuous operation regardless of dirty water conditions. With the strainer on the suction end of the hose these pumps do not clog. They are powered with a 4-cycle air-cooled anti-friction-bearing gasoline engine, the automotive-type high tension magneto ignition of which gives quick positive starting.

Illustrated literature describing this new line of light-weight pumps has just been issued by the manufacturer who will be glad to send copies to readers of this magazine on request.

New Sweeper-Blower Mounted on Tractor

Blowing of fines from the surface of a road base, as well as sweeping, before the application of the prime coat has been recognized as an important step in the laying of a bituminous pavement. The new Hough Sweeper-Blower for use with any standard wheel-type industrial tractor, recently announced by the Frank G. Hough Co., 919 No. Michigan Ave., Chicago, Ill., does both sweeping and blowing in one operation.

The unit consists of a brush of Hickorette fibre, or of steel bristles, 30 inches in diameter and 72 inches long for sweeping a path 60 inches wide, or 30 inches in diameter and 84 inches long for sweeping a 72-inch path. The broom is adjustable for ground pressure and can be raised from the tractor driver's seat. The brush is driven direct from the engine crankshaft through a ratchet-type clutch. All gears and bearings are enclosed and running in oil.

The blower has an exhaust-type fan, an impeller mounted on grease-sealed self-aligning ball bearings and a nozzle adjustable for surface clearance. It is driven from a countershaft by five V-belts and pulleys. The countershaft is mounted on self-aligning ball bearings and driven by universal couplings direct from the rear power take-off of the tractor. The frame has ample strength and rigidity to carry the weight of the fan and can be quickly attached to or detached from the tractor.

Literature describing this new tractor Sweeper-Blower may be secured by interested contractors or state and county highway engineers direct from the manufacturer.

Keeping Your Highways Clear in Winter Months

New literature describing the Snow King rotary snow plow for mounting on Caterpillar diesel tractors or on Walter Snow Fighters or FWD trucks has just been received from the Rotary Snow Plow Co., 1611 Central Ave., Minneapolis, Minn. This Snow King plow is designed to give summer widths to winter roads because it throws the snow clear off the highway.

Copies of these new bulletins may be secured by interested state and county highway maintenance engineers direct from the manufacturer by mentioning this magazine.

South Bend

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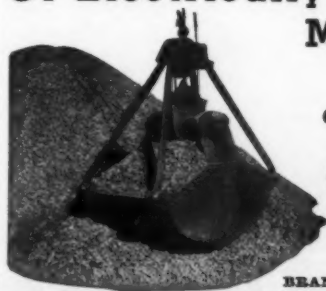
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THE LARGEST TRAILER
IN THE WORLD IS A
LA CROSSE!

"Musts" for County Road Organization

(Continued from page 1)

courage to say "No" in a kindly manner, not only to his enemies but also to his friends, when occasion demands it. The importance of confidence in the head of the department can not be overemphasized and he should do nothing which might jeopardize it.

Third, to minimize political squabbles over allocation of roads, there should be established definite road programs covering periods of from 3 to 6 years. The allocation of roads must be fair to all parts of the county. Cities as well as towns help pay for the roads so they should have representation on the committee which prepares the program, which should be as economically perfect as possible. At the same time it must be kept in mind that a perfect program, even if any one knew of what perfection consists, is of no value unless it commands the support necessary for approval and execution.

Fourth, secondary road programs are usually carried out by counties too small to afford extensive laboratory facilities or to employ experts for testing materials. The laboratory facilities of the Federal or state government should, therefore, be freely available for such smaller political units as need them. Federal or State aid can be offered in no more effective way than this.

Fifth, county programs and county highway departments should be subject, in a general way, to state supervision to afford protection from local political influences and to make available capable advisors as needed. But such supervision should not be so extensive that the initiative and progressiveness of the personnel becomes dulled by oppressive rules, regulations and red tape. Whether or not county employees should be under the Classified Civil Service depends upon the local political conditions; usually they should be.

Sixth, types of pavements for the various classes of roads should be decided upon in making up a program. Due to many conflicting interests sometimes involved, this is not an easy task but in reaching a solution of this problem the principles of highway economics should be applied.

Prior to 1920 Chautauqua County had no well-defined policy for allocating State-Aid money to towns for county road construction. Each year saw a political squabble for roads with the usual log-rolling and vote trading. The result was short stretches of inadequate road, beginning and ending nowhere and of little benefit to anyone. The Board soon realized the inadequacy of such a policy and appointed a committee to study the subject and report back to the Board. This resulted, in January 1921, in the adoption of a so-called 5-year program of about 100 miles of secondary roads designed to provide an outlet from each village and hamlet to a state road. The order of construction was fixed at the same time and there was a gentlemen's agreement that there would be no inserting of new roads on the list and that changes in the order of construction would not be permitted.

Contract vs. County Work

In 1922, the author, appointed County Superintendent of Highways, found construction going on, half by contract and half by departmental forces. Having had long experience in the state highway department, I was definitely of the opinion that contract work was the better method for carrying out a public works program. Nevertheless, part of the departmental work going on at the time appeared to be executed as efficiently as the part being performed by con-

tract. Moreover considerable county-owned war equipment was on hand so it seemed advisable to give each method a fair trial and compare results.

With some reorganization and the introduction of better methods, I found that, contrary to my previous opinion, the departmental work soon proved to be superior in cost, speed, quality of work and satisfaction to the public. Consequently since 1924 all county highway work has been done in this manner. Realizing that my statement will be received with skepticism by some and challenged by others, I nevertheless feel it my duty to say that the savings so effected approximate 30 per cent of the cost of the regular work. While there are many reasons why this can be accomplished under favorable conditions, it can be done only where politics are eliminated from the highway department. Under other circumstances, and especially for large units such as state and Federal work, I still uphold the contract system.

The first road program was completed in the established order of construction in about four years. The public and governing officials were so well pleased with the work that in 1924 a similar program was adopted, consisting of 76 miles of construction and 34 miles of reconstruction of inadequate roads built prior to 1920. This program was completed in four years. In the prosperous year 1928 another quite ambitious program was adopted. The depression caught us in the middle of it and, as the expected funds were not forthcoming, it was not until November 1937 that the fourth program was adopted. This program will probably continue until about 1944.

Farm-to-Market Roads

The 1928, or third, program differed from previous ones in that it recognized the immediate need for many miles of what are now called farm-to-market roads and comprised three classes of work: Class A, first-class macadam, or better, two-lane roads on 36-foot wide 12-inch gravel foundations; Class B, similar to Class A but with no top; Class C, narrow farm-to-market 12-inch gravel roads.

Class A roads were to be built on the most important routes where a pavement was needed at once. Class B was to be used on roads somewhat less important but which would be likely to need a bituminous top in the future. They were to be graded, drained and given a foundation similar to Class A so that top could be put on at some future date. Class C were strictly farm-to-market roads of cheap construction but adequate for the traffic. They were fairly well graded and drained but were not as wide as Class A and B and their cost was planned to average about \$5,000 a mile.

This scheme of building three classes of roads worked very well. The chief drawback of the program was that, due to the depression and consequent lack of funds, its completion was delayed and some of the Class B roads which were first built attracted so much traffic that it became difficult to maintain them as

gravel roads, particularly as the gravel available is soft and not especially suitable for a wearing surface. This drawback can be avoided by the adoption of shorter programs.

Black-Topping Adopted

The fourth program, recently adopted, consists in substantial degree of placing black top on the former Class B roads. It also provides for additional Class B and Class C roads and makes provision after five years for a reconsideration of the program, should it not then be completed, so that any worthy projects developing in the interim may be given due consideration.

Thus, by 1944, Chautauqua County will have been working for 24 years on definitely planned programs. Knowing about what was ahead of us, we were able to plan personnel, buildings, plant machinery and equipment to carry on the work steadily and in the most economical manner.

From a paper presented at the 1938 Annual Meeting of the Association of Highway Officials of the North Atlantic States at Atlantic City, N. J.

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Low-Cost Road-Mix For Arkansas Road

(Continued from page 19)

or sealing in the afternoon when it was desired to do either.

The cut-back used in this mixture was a special type known as RC-2C having penetration limits of 120 to 150, viscosity of 200 to 275 at 122 degrees F., and a ductility of 100 centimeters at 77 degrees F. The residual asphalt in this cut-back averaged 75 per cent.

Mixing

Mixing was done with an Adams No. 3 retread paver pulled by an Allis-Chalmers LO tractor. It was started immediately after the third application of asphalt and was continued until an absolutely uniform mixture was obtained. The amount of mixing needed varied with aggregate grading and air temperature but averaged seven round trips with the Adams paver. An unusual degree of uniformity in mixing was obtained, the resulting mixture resembling closely the output of a hot-mix plant. Ordinarily mixing was completed by dark but occasionally additional mixing had to be done the following morning.

Curing

Curing was merely a continuation of the mixing process and was done the following morning with the Adams retread paver and LO tractor. Apparently the time element had very little effect on the curing, air temperature and the amount of manipulation governing the rate at which the solvent evaporated from the mix. Practically no curing occurred in the undisturbed windrow and, as the season progressed and the average air temperature fell, more manipulation and surface exposure was necessary. Five to nine round trips with the retread paver ordinarily reduced the solvent content to less than 8 per cent which was the maximum allowable at the time of spreading and rolling.

The tests for volatile content were made in the field laboratory of the Department of Materials and Tests (C. & E. M., March 1938, pg. 15). The test was an ordinary distillation made with steam at a temperature of 400 degrees F. Extraction tests to determine the residual asphalt content of the mix were also made daily in the field laboratory.

It developed that, although a mixture containing volatiles to the amount of 8 per cent of the bituminous part could be spread and rolled to give a smooth riding and stable surface, an even better riding surface with equal stability could be obtained by reducing the volatile content to less than 5 per cent although the mixture, in that state, appeared dry and un-cohesive.

Spreading and Rolling

Spreading was done by first splitting the mixed and cured windrow into two equal windrows lying on the quarter-points of the area to be surfaced and then spreading these to a uniform thickness and surface with the Adams retread paver. Two or three trips were then made over the spread with a Servis motor shaper following the retread paver to give the final shaping and improve the riding surface. The surface was checked during this operation for uniformity of thickness as well as with a crown-template and a straight-edge 10 feet long. After the spread was found to be acceptable, rolling was begun, using two Huber 5-ton three-wheel gas rollers. Rolling was started at the outside edges with the outside back wheel overhanging by half its width, and proceeded toward the center, each longitudinal trip overlapping the preceding trip by half a wheel-width. After rolling the surface was again checked as before,

any inequalities remedied, and rolling continued until the surface was satisfactory and no further compaction could be obtained. Although a variation of $\frac{1}{2}$ inch in 10 feet was permitted under the specifications, this job was spread much more smoothly than that, with no variation exceeding half the allowable amount occurring in the finished surface.

Sealing

For the seal coat an application of 0.3 gallon per square yard of RC-2C cut-back was made at approximately 140 degrees followed immediately by the application of 15 to 20 pounds of pea gravel per square yard. This gravel, which was shipped in from commercial plants at Harrell and Camden, Arkansas, met the following specifications:

	Per Cent
Retained on $\frac{1}{8}$ -inch square screen	0
Retained on $\frac{3}{16}$ -inch square screen	0-5
Retained on No. 8 square screen	85-100
Retained on No. 16 square screen	97-100

The same distributor was used with the long spray bar mentioned above and the cover material distributed with a Buckeye mechanical spreader, broomed with a multiple-brush drag broom and rolled with the two Huber rollers mentioned previously, in the same manner as the wearing course.

Major Quantities

The principal contract items and bid prices were as follows:

Item	Quantity	Unit	Price
Common excavation	43,281 Cu. Yds.		\$0.25
Reconstructed base course	384,498 Sq. Yds.		0.015
Gravel base course	95,062 Cu. Yds.		0.35
Prime coat application	97,840 Gals.		0.0025
Mineral aggregate in seal coat	3,360 Tons		2.00
Bituminous material in seal coat	65,230 Gals.		0.0935
Mineral aggregate in surface course	23,395 Cu. Yds.		1.06
Bituminous material in surface course	489,205 Gals.		0.081

Personnel

The work was done by the Uvalde Construction Co. of Dallas, Texas, under the personal management of H. D. Hamilton, Superintendent. The engineering forces were under the direction of L. C. Brown, Resident Engineer, and the author, both of the Arkansas Highway Commission.

New Roller Chain Data Book

The new data book No. 1757 on Link-Belt Silverlink roller chain and sprockets for drives and conveyor uses has recently been published by the Link-Belt Co., 300 W. Pershing Road, Chicago, Ill. This volume of 174 pages contains practical information, application pictures and engineering data, including many

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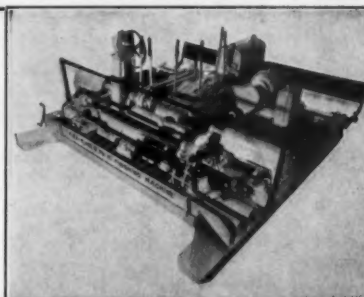
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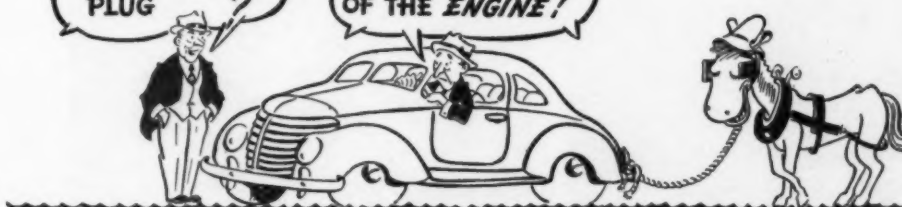
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← Pouring and Finishing Concrete Base on the Lane Construction Corp. Hot-Mix Surface Contract.



The L-B Bituminous Distributor with the Double Offset Spray Bar Which Was Used for the Three Applications of Asphalt on the Uvalde Construction Co. 27-Mile Road-Mix Surfacing Job in Arkansas Last Summer. See Page 5.

→ Spreading 20-Foot Hot-Mix Surface on the Lane Job Between Brunswick and Augusta, Me. See Page 2.



The Larger Rectangular Tank at the Marine Studios During Construction, Showing the Port Holes Through Which Visitors and Scientists May Now View and Photograph Various Forms of Sea Life. The Interior of the Tank Is Lined with Gunite and At One End Shelves Were Built to Carry Coral and Rock to Form a Natural Habitat for Small Fish. Right, a Seal Sporting in the Circular Tank. See Page 2.



One of Fourteen New International Trucks Owned by the Concrete Delivery Co., Buffalo, N. Y., Shown with a Blaw-Knox Truck Mixer Delivering Concrete for the Tift Street Viaduct, Buffalo, For Which John W. Cowper Was the Contractor. Concrete and Other Material Were Furnished by the Buffalo Slag Co. and Hauled by the Concrete Delivery Co.



One of the Largest Girders Ever Made Being Swung Into Place in the Winans Overpass in Baltimore, Md. See Page 22.



A Night View of the Sodium Safety Lighting for the Lincoln Highway Bridge Across the Mississippi at Clinton, Iowa. See Page 9.



A Le Tourneau Angledozer Mounted on a Caterpillar D7 Tractor Removing Snow from a Klamath County, Oregon, Road Last February.



← The Batching and Mixing Plant of American Concrete & Steel Pipe Co. for a Section of Pipe for the Colorado River Aqueduct Contract.

→ Square Steel Rods Reaching to the Bottom of the Concrete Pipe Forms Were Rotated to Secure Greater Compaction. See Page 16.



